

Credibility of Health Information and Digital Media: New Perspectives and Implications for Youth

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The Special Role of Health Information

Searching for health information online is often said to be one of the most common activities on the Internet.¹ Such sweeping (and only partially accurate) claims are mostly based on survey data, such as the Pew Internet & American Life Report,² which found that "80% of adult Internet users, or about 93 million Americans, have searched for at least one of 16 major health topics online." The report concluded that "this makes the act of looking for health or medical information one of the most popular activities online." Other surveys from industrialized countries have arrived at similar conclusions. For example, Statistics Canada concluded that between 1999 and 2003 health information was the most prevalent Internet activity each year aside from e-mail and "general browsing," well ahead of such things as searching for travel information, government information, or electronic banking.³ Surveys further show that these trends also apply to young people.⁴ For example, a recent survey of 1,100 U.S. teens ages 12–17 found that 31 percent reported seeking health information online (representing 6 million people), and that teens' use of the Internet for this purpose was up 47 percent since 2000.⁵ Another survey found that three quarters of youth between the ages of 15 and 24 have used the Internet to get health information.⁶

However, the impression these survey data are generating that most people are using the Web mainly for health information is misleading. For example, other uses may be underrepresented. Social desirability biases can lead people to answer questions about how they use the Web in a manner they deem socially acceptable. As a result, searching for pornography, for example, is a prevalent activity on the Web⁷ that may be underreported in a survey.

Another issue with survey research in this domain is that the definition of "health" is sometimes problematic. For example, fitness, sports, wellness, diet, and food information may or may not be regarded as health information, with no clear-cut boundaries.⁸ For example, Lenhart et al. observed that "when we ask adult Internet users if they ever go online to simply look for 'health or medical information' . . . 66% report doing so. However, when we ask about a wide range of health topics (e.g., 'Have you ever looked online for information about exercise or fitness?' or 'For information about immunizations or vaccinations?') 80% of adult Internet users say they have researched at least one of those specific health topics at some point."⁹ Similar results were found for youth in the same study.

Finally, surveys often do not accurately assess the prevalence of day-to-day health information-seeking activities. To gauge these, one has to directly observe Web traffic or monitor what information people are searching for on a daily basis. Indeed, several independent

studies using these more “direct” methods to gauge online activities by tapping into the data sets from various search engines have concluded that the actual volume of health-related searches on the Internet as a proportion of all searches conducted each day is around 5 percent. By comparison, searches for issues related to entertainment, shopping, pornography, research, places (e.g., searching for cities, landmarks) or business (e.g., stocks, personal finance) are much more popular.¹⁰ Thus, survey and search data combined suggest that searching for health information is a popular, but not necessarily *frequent*, activity for most people (chronically ill people being a notable exception).

This usage pattern of health information has several implications: although people may know where to go for news, weather, movie reviews, shopping, and business information, health and medical questions arise infrequently enough such that people do not necessarily have a trusted brand name or portal in their mind as they begin a search. Thus, whereas people may be savvy and experienced enough to evaluate the credibility of a general news Web site or an e-commerce site, they may have insufficient experience and expertise with health Web sites, which are generally not used on a day-to-day basis. This may be particularly true for many young health information seekers, who may not have experienced a lot of prior health problems in their lives.

While trusted commercial health portals (e.g., WebMD) and noncommercial, government-sponsored health portals (e.g., Healthfinder, MedlinePlus, Canadian Health Network) exist, people with specific health problems or questions mostly enter a health-related search term directly into a search engine, not necessarily going through a portal site.¹¹ For example, in one study among youth, only 16 percent said they go directly to a particular site to research a health issue, while the majority said they used a general search engine (60 percent). Another 23 percent reported that they “just came across” health information while browsing the Web.¹² Yet, surprisingly few cases of harm due to online health information have been reported, with the majority due to self-medication¹³ and/or self-diagnosis. One systematic review concluded that only a few cases of harm have been reported in the medical literature.¹⁴ Indeed, as part of the European MedCERTAIN project, researchers set up a special database of adverse events related to the Internet to systematically collect cases where consumers have been harmed by health-related Internet information, but very few cases have actually been submitted.¹⁵

Nonetheless, and in spite of its low prevalence to date, the potential for physical and mental harm caused by people applying dubious, low-quality, or untrustworthy information illustrates the importance of considering the credibility of online health information in particular. While generally most encounters with dubious information may result in negative financial, social, or personal consequences, health information can literally be a matter of life and death. Therefore, educating consumers and providers of health information and services about how to avoid “low quality” information becomes paramount. Because top-down quality assurance mechanisms provided by the government and other entities are not realistic or—at least in Western countries—not ethically acceptable solutions,¹⁶ consumer education on how to identify quality information is crucial.

In addition to the potential harm caused by online health information (which in this chapter includes information on Web sites, but also information delivered through other Internet channels, such as e-mail or in newsgroups, and, by extension, also information delivered through other digital media such as mobile devices), the enormous potential benefits of the Internet and digital media for public health must also be considered. The fact is that there is a great deal of high-quality information on the Web that is published by trusted

organizations. It is important for these organizations to appear credible enough to initiate a behavior change in consumers. Thus, to understand how people assess the credibility of a site, source, or piece of information is a key task in the development of any health education or health promotion undertaking and, thus, an important area of research. This latter “positive” aspect of the importance of credibility research in the health arena is often overlooked in the literature, and has been overshadowed by discussions and research focusing on the harmful potential of low-quality information on the Internet.¹⁷

How Do Consumers Access and Assess Health Information?

Many adults say that they (still) trust their doctors more than the Internet, yet in many cases the Internet is the first channel of information consulted. Hesse et al. suggest that physicians remain the most highly trusted information source to patients, with 62 percent of adults expressing “a lot” of trust in their physicians.¹⁸ When asked where they preferred going for specific health information, 50 percent reported wanting to go to their physicians first. However, when asked where they *actually* went, only 11 percent reported going to their physicians first, while 48 percent said they went online first. It is obvious that either the degree of mistrust in health information does not run as deeply as surveys suggest, or that the convenience and accessibility of Internet information outweighs quality concerns at least for some health problems, and/or that consumers have found ways to cope with less trustworthy information, or—most likely—a combination of those factors.

In reality, consumers likely triage their conditions with the easiest or most appropriate information source first, and may end up using both Internet information and doctors in a complementary manner. Indeed, the convenience of accessing online self-care information rather than visiting a health professional is often cited as a motivation for using the Internet before seeing a doctor. For example, in one focus-group study, a teenager said, “I wanted to know how to get rid of a wart on my toe without the doctor—so I looked on the Internet and it told me stuff like how to get rid of plantar warts.”¹⁹ At the same time, many consumers recognize the limitations of self-care and will be more wary to bypass health professionals if they have a more serious disease. For example, in the same study, another teenager said, “You’re not going to go on the Internet if you have cancer . . . if you’ve got a big tumor or something.”²⁰ Still, even for serious diseases such as cancer, consumers are known to consult the Internet before and/or after a physician visit. This is especially true for patients who are younger,²¹ more highly educated, and those with more severe diseases.²² Overall, patients generally describe the health information they find from the Internet as trustworthy, and the majority of patients use that information as a basis for discussions with their doctor.²³

Although “the Internet” typically receives a lower average trustworthiness rating than a concrete person (“my doctor”) in surveys, this does not necessarily mean that people do not perceive *some* Internet resources as *more* trustworthy than their doctors. However, while some people may have completely lost trust in their own doctor and, consequently, turn to Internet-based Web doctors or medical webmasters for advice instead, for most people consulting the Internet has more to do with a desire to obtain as much information and as many perspectives as possible, to make sure nothing important has been missed, and as a coping strategy.²⁴

Once on the Internet, most adults²⁵ and youth²⁶ are very aware that credibility evaluation of health information is paramount. A Pew Internet Survey stated that “compared to other Internet users, health seekers show greater vigilance in checking the source of online

information” and that 86 percent of people seeking health information “are concerned about getting health information from an unreliable source online.”²⁷ However, while people often claim that the source of the information is their primary yardstick when evaluating credibility,²⁸ direct observational research in a lab setting shows that health consumers rarely look at the credibility of the source.²⁹ Consistent with other research on credibility,³⁰ these studies further conclude that, in reality, consumers are more impressed by surface credibility markers, such as Web site design (e.g., whether it appears “professional”). Some consumers even use markers such as the picture of the site owner to determine credibility of the site and its information.³¹

Role of Digital Health Information for Youth

Adolescence is a period where individuals face multiple health-related challenges and questions. For example, questions arise as teens discover their sexuality or experiment with drugs and alcohol, and concerns arise owing to common medical conditions that tend to manifest themselves during adolescence including, for example, acne, mental health disorders such as schizophrenia and depression, smoking, or eating disorders such as obesity or anorexia.³² This coincides with a phase of life where cognitive abilities develop rapidly,³³ and when most adolescents have easy access to the Internet at home and/or at school.³⁴

Young people may be especially vulnerable to problems with regard to online health information seeking. For example, Rideout argues that the Internet is likely an especially important source of health information for young people in particular, given that they are often concerned with issues that may be sensitive and hard to talk about, and because many young people have not yet established a relationship with a doctor other than their family doctor.³⁵ The implications of this, she says, are unclear: “Increased access to health information could create a more informed and healthful youth. On the other hand, if the quality of online information is not high or the source unknown, increased reliance on the Internet could lead to greater misinformation and skepticism.”³⁶ Of course, “young people” constitute a heterogeneous group, and whether online health information seeking leads to an informed or a misinformed youth is likely to be a function of an individual’s age, maturity, cognitive development, and information literacy.³⁷

Health information-seeking behavior varies depending on the age of youth. For instance, two representative surveys focusing on youth conducted in 2000 and 2001 by different research groups (Pew and the Kaiser Family Foundation, respectively) arrived at very different conclusions regarding the relative importance of health information compared to other types of information that young people sought online. The Pew report surveyed people between the ages of 12 and 17, while the Kaiser report surveyed “youth” between the ages of 15 and 24. The Pew Internet survey found that looking for health-related information ranked *lowest* compared to other topics among teenagers who are online. Looking for health information was reported by only 26 percent of teenagers.³⁸ In contrast, the Kaiser Family Foundation survey found that as many as 75 percent have used the Internet at least once to find health information.³⁹ These discrepant findings are most likely a result of the two surveys dealing with different age populations, with younger teenagers seeking health information to a lesser extent than older youth.

The Pew report also noted that health information seeking seemed to increase by age. Older girls and boys were the most likely to look for health, fitness, or dieting information (40 percent of girls and 26 percent of boys ages 15–17 reported that they had done so). In contrast, only 18 percent of the younger (ages 12–14) teens said they had looked for

health information online.⁴⁰ Moreover, a good proportion of these health-related searches are related to topics pertaining to sexual health or drugs.⁴¹ With awakening sexuality and increasing autonomy, certain health-related issues become important, while traditional sources of information (parents, teachers) are often challenged and begin to lose authority in the eyes of teens.

Nonetheless, the Kaiser Family Foundation survey found that among young people ages 15–24, the most significant (and most credible) sources of health information continued to be traditional sources such as health classes at school, parents, and doctors.⁴² Furthermore, information from parents, school, TV, and friends is trusted much more than Internet information. Only 17 percent said they trusted Internet-based information “a lot,” whereas 85 percent said they trusted doctors, 68 percent said they trusted parents, 30 percent said they trusted TV, and 18 percent said they trusted friends “a lot” when it came to health information.⁴³ That said, the Internet is a much more abstract and variable entity than “parents” and, when thinking of the Internet, most respondents primarily think of the variable quality of information on the Web, rather than thinking of specific Web sites they use. Also, when assessing the trustworthiness of Internet information, many respondents may not consider other Internet tools such as e-mail, chat, instant messenger, or social networking sites, which may actually help them to identify credible information on the Web.⁴⁴

Gray and colleagues speculate that youth do not use the Internet as their “first port of call” when looking for health information, but rather as a last resort,⁴⁵ but little or no direct observational data exist to support or refute this hypothesis. Furthermore, as the foregoing review suggests, age or maturity of the youth in question and the perceived severity of the young person’s medical condition should also be considered. For sensitive or embarrassing health topics that are not perceived as “severe diseases” including, for example, pregnancy and birth control, sexuality, drug and alcohol abuse, violence, smoking, depression, and weight loss, information is often sought from the Internet, sometimes as the primary source.⁴⁶ In summary, while adults and youth both often say they trust other sources more than sources on the Internet, only preadolescent youth seem to consult primarily other sources (parents) first, whereas adolescents and adults often use the Internet before consulting other sources, including health professionals.⁴⁷ One explanation for this difference may lie in the fact that during adolescence, teenagers become more autonomous and increasingly learn to rely less on traditional authority figures and intermediaries, which in turn is a result of increased cognitive abilities and skills⁴⁸ combined with a tendency and desire to challenge authority or societal rules as a means to establish individuality. The theory that *autonomy* (desired or actual) is a critical variable explaining differences in information seeking and information-appraisal behavior is explored in greater detail later.⁴⁹

What Is Special about Credibility in Digital Media?

Flanagin and Metzger note several factors about digital media that raise credibility concerns,⁵⁰ but specific considerations in the context of health information warrant special attention. For example, the lack of quality control (e.g., editorial boards, peer review) on the Internet, coupled with the extremely cheap publishing process online, result in less need to adhere to the highest publishing standards.⁵¹ Although there is of course a large amount of information online that has gone through some sort of peer review,⁵² many people, and perhaps youth in particular, have difficulties discriminating between peer-reviewed (or editor-controlled) and non-peer-reviewed material.⁵³ For example, in a study with college students, nearly half

of the respondents had trouble discriminating between primary and secondary sources of information, as well as between references to journal articles and other published documents, and when presented with questionable Web sites on nonexistent nutritional supplements, only 50 percent of respondents were able to correctly identify the Web site with the most trustworthy features.⁵⁴

Part of the trouble in discerning trustworthy sites from dubious ones is the result of a *deficit of context*, which can be particularly deleterious for health information.⁵⁵ For example, a Web site created by an individual can look equally professional and credible as the home page of, say, a professional organization, making it more difficult for consumers to distinguish who sponsored the Web site.⁵⁶ Also, search engines often send consumers directly to a particular Web page on a site, bypassing the home page, thereby making it difficult to discern who is behind a certain Web site and what the authors' motives and qualifications are.⁵⁷ Together, these issues, coupled with ambiguity about why, how, and for whom Web information is produced, have been referred to as "context deficit."⁵⁸ Context is particularly important in medicine, as information does not necessarily have to be inaccurate in order to have the potential to harm—accurate information that is taken out of context can also be harmful.⁵⁹

Another aspect of the context deficit presented by digital media is the blurring of lines between different genres of information, in particular between advertising and informational content.⁶⁰ In the medical domain, such blurring reached headlines in September 1999, when one of the once-leading health portals, <http://DrKoop.com>, was criticized for lack of "Web ethics." In an article published in the *New York Times*, the site (partly owned by former U.S. Surgeon General C. Everett Koop) was accused of inadequately distinguishing between editorial content and promotion. For example, DrKoop.com published a list of hospitals designated as "the most innovative across the country," not revealing the fact that these hospitals actually paid for the listing. Moreover, the site was criticized for calling advertisers "partners." In addition, DrKoop.com violated the medical ethics guidelines of the American Medical Association by making money through referring patients to other physicians without revealing this fact. The incident sparked the development of codes of ethics for health Web sites.⁶¹

Additional concerns are particularly relevant for the health field. For example, digital information by its very nature is cheap and easy to multiply or copy online. Multiple copies of a piece of information can lead to a lack of editorial ownership and control, with no one person responsible for taking it down or updating all copies. The original custodian or creator of the information, who is the one most familiar with the information, is unable to exert control over the multiple copies disseminated in a digital universe. Compounding this problem, health information has a particularly short half-life and needs to be continuously updated in order not to lose its value and validity.

Other features of digital health information make credibility and quality considerations important as well. The ability to mass-customize interactive applications can lead to higher involvement by users and, thus, perhaps greater impact on individuals.⁶² According to a recent review, interactive health care applications developed by domain experts appear to have largely positive effects on users, in that users tend to become more knowledgeable, feel better supported socially, and may have improved behavioral and clinical outcomes compared to nonusers.⁶³ A meta-analysis comparing Web-based interventions versus non-Web-based interventions found improvements in outcomes such as increased exercise time, increased knowledge of nutritional status, increased knowledge of asthma treatment, increased participation in health care, slower health decline, improved body shape perception, and eighteen-month weight loss maintenance.⁶⁴ Interactive digital media clearly have a

significant potential and perhaps even an advantage over traditional media to engage people, to establish credibility, and to lead to changes in behavior.⁶⁵ However, interactivity also poses dangers if the wrong message is delivered in a credible and engaging way. In the end, the enormous reach of digital media brings a potential to affect the health of large populations, both positively and negatively.

Another aspect that makes quality and credibility considerations particularly important in health communication is that people use digital media to retrieve information “on demand” and “just-in-time,” for example, by typing in a respective query into a search engine when and where they need it (“My child has fever, so let’s see what I can find on the Internet”). As a result, they are more likely to apply this information and act on it immediately. Of course, mobile devices and future “ambient/ubiquitous” computing applications further increase the just-in-time accessibility of information. By contrast, health information in traditional “push” media (e.g., newspaper, TV, radio) is usually only relevant to and applicable for a small proportion of users who encounter it more or less by chance.

A related problem is the larger effect of what has been called “self as source,”⁶⁶ which is the influence of people’s prior attitudes and knowledge, biases, and misconceptions on the kind of information they encounter. This influence is enhanced in “information pull”-based digital media, because people have greater control over what information they retrieve compared to “push” media. For example, entering “rapid cure for lung cancer” in a search engine leads to qualitatively different articles on cancer than entering “small cell carcinoma treatment,” and a search query including the phrase “evidence that X is caused by Y” will return preferably documents confirming that indeed X is caused by Y (even if it is not true), thereby presenting a biased search result that confirms the bias in the recipient.

A final reason why digital media are different with regard to health information is that content and cues helping to assess the credibility of that content can be delivered separately, and both can be dynamically and intelligently tailored to the individual. The Internet is not a static medium such as a newspaper, book, or patient leaflet, where once a person has obtained misinformation there is little health professionals can do to correct the information. On a decentralized, electronic medium, peers and intelligent systems can give consumers additional information about a topic from other sources and perspectives, which can mediate (reduce or enhance) their trust in a message in a personalized, tailored way. This process shall be called “apomediation” henceforth,⁶⁷ and is explicated in the following sections. Apomediation will be used to illustrate that the networked environment not only provides new challenges for credibility, but also provides new solutions.

From Intermediation to Disintermediation and Apomediation

Much of the debate on quality and credibility in the digital age is a result of a social process of “disintermediation” through digital technologies, and the health industry is no exception. Just as in many other areas of life (e.g., the travel industry), information and communication technologies empower consumers to access pertinent information or services directly, cutting out the middleman or gatekeeper (or *intermediary*), such as the travel agent, real estate agent, librarian, pharmacist, health professional, or journalist.⁶⁸ With direct and convenient access to abundant health information on the Internet, consumers may now bypass the expert intermediary and gain direct access to unfiltered information.⁶⁹ Apart from “general” health information found on the Internet, consumers may also be able to access their own personal health information from their electronic health record.⁷⁰ Similarly, youth can bypass

traditional gatekeepers and authorities such as parents or teachers. In this situation, consumers must assume new responsibilities.⁷¹

As the role of “human” intermediaries diminishes or changes, consumers and patients are finding new ways to locate relevant and credible information. The agents that replace intermediaries in the digital media context may be called “apomediaries,” because rather than mediating by standing “in between” (inter-) consumers and the services or information they seek, they “stand by” (apo-) and provide added value from the outside, steering consumers to relevant and high-quality information without being a requirement to obtain the information or service.⁷² While the traditional intermediary is the “expert,” apomediaries consist of a broader community including experts, parents, teachers, peers, and the like, who are networked in a digital environment.

While intermediaries typically engage in “upstream filtering,” apomediaries enable and facilitate “downstream filtering.” Upstream filtering is characterized by a limited number of gatekeepers (usually experts, authorities, professionals) setting quality criteria, performing evaluations, and giving access only to selected information that has been vetted by them. In contrast, “downstream filtering” is characterized by third parties (experts, authorities, professionals, peers) mainly communicating selection criteria to users, with evaluations and eventual filtering taking place further “downstream” by end users or apomediaries. In so doing, these evaluations incorporate the values and preferences of individual end users.⁷³ An extreme example to illustrate upstream versus downstream filtering can be seen in the following: some countries such as Saudi Arabia direct all international Internet traffic through a central proxy farm with content filters to block access to pornographic and other “inappropriate” material, which can be referred to as an “upstream” filtering approach.⁷⁴ By contrast, labelling of pornographic material using metadata (i.e., electronic labels) provided by the author or a community of users empowers end users to set their own thresholds on what is acceptable for them, which can be referred to as downstream filtering.⁷⁵ Upstream filtering, however, need not be synonymous with censorship. “Weaker” forms of upstream filtering include Internet portals that include only links selected by experts, the traditional peer-review process for publishing academic papers, and the traditional editorial process for news articles. Downstream filtering, by contrast, is exemplified by editorial control based on user rankings and social bookmarking, by Web sites such as Digg, where news stories and Web sites are submitted by users, and then promoted to the front page through a user-based ranking system.⁷⁶ Apomediaries—such as users and friends in the case of Digg—can help users navigate through the onslaught of information afforded by networked digital media, giving additional credibility cues and supplying further metainformation. Other examples of apomediaries and apomediation tools include consumer ratings on amazon.com or epinions.com; technologies like PICS or MedPICS labels that enable machine-processable dissemination and interpretation of user ratings;⁷⁷ collaborative filtering and recommender systems as exemplified by StumbleUpon.com; and other second-generation Internet-based services and tools that let people collaborate on a massive scale and share information online in new ways, including social networking sites, social bookmarking, blogs, wikis, communication tools, and folksonomies.⁷⁸

Parallels between Disintermediation during Adolescence and Digital Disintermediation

Some interesting parallels exist between processes of disintermediation in health care and other industries, and the individual emancipation process that takes place during

adolescence. As mentioned earlier, one of the key themes during adolescence is that as children grow into teenagers they become more autonomous and rely less on traditional authority figures. They strive to become more independent and desire to reduce the influence of traditional intermediaries (e.g., parents), with peers (apomediaries) partly taking over the role of these former intermediaries.

Ling describes adolescence as a time when emancipation from one's parents is of central concern.⁷⁹ As such, teens have a strong motivation to "establish themselves as independent social actors who are outside the sphere of their parents." Peers become important as teens make the transition to adulthood by helping them "to work out a relationship to the various facets of adult life," which they do in part by providing "the teen with a sphere in which he or she can assert control and participate more fully in decision making." Ling further argues that teens' desire for autonomy in part drives their avid use of digital media because "these modes of communication facilitate emancipation" since they lower the threshold for social interaction by giving teens more freedom, control, and privacy to access peers or others outside of the family.⁸⁰

Thus, for younger users of digital media, the disintermediation/emancipation process takes place at two levels during adolescence. One is the naturally occurring emancipation process from parents, guardians, teachers, and other traditional authorities; the other is an empowerment and emancipation process that is enabled and supported by the digital tools for communication that youth use, which themselves reinforce and enable disintermediation and apomediation. These parallels will be explored further, as part of the dynamic disintermediation/apomediation model, which is explained in greater detail next.

The Dynamic Disintermediation/Apomediation Model

One impact of networked digital media is that people are being pushed to be more informationally self-sufficient.⁸¹ For adolescents and adults alike, autonomy (a person's ability and motivation to think, feel, and make decisions on his or her own) thus becomes the common basis for disintermediation/apomediation. While autonomy is a key theme during adolescence, "the development of autonomy does not end after the teen years. Throughout adulthood, autonomy continues to develop whenever someone is challenged to act with a new level of self-reliance."⁸²

In health care, new autonomy challenges include the patient journey after diagnosis of a chronic disease. For example, an elderly patient newly diagnosed with Type II Diabetes might initially rely on health professionals (intermediation), but later may develop sufficient autonomy through increased knowledge and self-efficacy to obtain health information from the Internet (disintermediation). The information she relies on may range from Web sites to using a network of peers in newsgroups as apomediaries, thereby relegating the former intermediary (her doctor) to just one actor among many others in an apomediation network. In other situations, however (e.g. finding a newly spotted tumor), the same individual might fall back to the intermediation model, opting not to bypass a health professional, before she again becomes sufficiently motivated and capable to do independent research on the Web, thereby moving to an apomediated model.

What predicts whether in a given situation an intermediary is preferred over an apomediation model, provided both are options? While personality traits and developmental factors may broadly predispose individuals to generally prefer one approach over the other, the decision to use apomediaries versus intermediaries remains largely *dynamic and situational*.⁸³

As will be argued later, this has implications for individuals' credibility assessments. As stated above, *autonomy* (desired or actual) seems an important prerequisite for bypassing traditional authorities. Autonomy is generally associated with variables such as knowledge, ability, and self-efficacy. Thus, it is plausible to argue that the better informed individuals are, and the better they know what information or services they need, the less likely they will require and seek an intermediary. In the health context, compared to a person with an acute illness, a knowledgeable person with a chronic condition, such as diabetes, will have a greater capacity and perhaps inclination to critically appraise information found on the Internet, and may have less need for an intermediary, at least for satisfying information needs (medical treatment being a different matter).

Cognitive abilities and literacy also play a role. A more mature adolescent eager to learn about sexuality is less likely to rely solely on an intermediary such as a parent or teacher than is a younger child with limited cognitive ability and "eHealth literacy," which includes media, computer, health, and functional health literacy skills.⁸⁴ Indeed, studies find that with increased media literacy of the recipient (including the ability to distinguish different types of information such as editorial content versus advertising) and prior knowledge about message content, the effects of source expertise on credibility can be attenuated such that the credibility of "experts" and other authorities decreases.⁸⁵ Finally, *self-efficacy*, or the belief that one has the capabilities to execute the actions required to manage a situation, is a further prerequisite to bypass the intermediary. Self-efficacy, in turn, is fueled by experience, social modeling ("If they can do it, I can do it as well"), and positive reinforcement.⁸⁶

The dynamic intermediation/disintermediation/apomediation (DIDA) model presented in Figure 1 proposes how disintermediation is initiated, sustained, and can be reversed through a process called "reintermediation." The model proposes that information, which is often initially mediated and filtered by an intermediary, usually increases knowledge and self-efficacy and, hence, autonomy. The dotted arrow indicates that if individuals do not perceive they have enough knowledge, self-efficacy, and autonomy, they will continue to rely on an intermediary. However, once a critical threshold of knowledge, self-efficacy, and autonomy is exceeded, individuals may feel sufficiently empowered to bypass the intermediary and to rely more on apomediations. Furthermore, in cases of perceived success, for example, when consumers find what they want and are reassured by apomediations that what they found is credible, a positive feedback loop is created, where self-efficacy and autonomy are further fueled and the consumer is even more encouraged to prefer apomediation over experts or intermediaries in future similar situations. Here again, there are interesting parallels to what is happening during adolescence as youth gradually emancipate themselves from traditional authority figures and become increasingly self- and peer-reliant.

As mentioned above, the decision to use an intermediary or to bypass the intermediary is situational, and the positive-feedback loop can be broken at any time, leading to a process of reintermediation. For example, this is likely to occur if the apomediation approach is perceived to be a failure, or if the individual is confronted with a new situation, where knowledge, self-efficacy, and/or autonomy are perceived as insufficient (e.g., a new, threatening medical condition).

The DIDA model has limitations in that it does not apply to situations where external factors "force" people into apomediation. For example, patients may choose to consult the Internet rather than a health professional because they do not have health insurance, or simply because they do not have time to see a doctor.⁸⁷ In both cases, the decision to abandon an intermediary is made for reasons that are unrelated to a desire for more autonomy. On

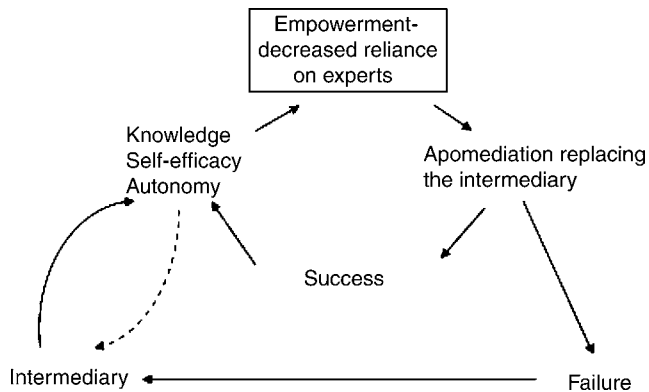


Figure 1
Dynamic intermediation/disintermediation/apomediation (DIDA) model.

the other hand, even in these situations it might be argued that patients have a higher desire for autonomy than other patients in a similar situation who are willing to pay a consultation fee or who go through the inconvenience of scheduling an appointment. The DIDA model is also only applicable in the context of information seeking. However, intermediaries, such as physicians, parents, teachers, also have other roles that go far beyond information filtering. So, users may on one level “bypass” the intermediary when it comes to information seeking and information evaluation, but this does not necessarily mean that the relationship with the intermediary ends.

The power relationship between the recipient and the intermediary does, however, change as a result of disintermediation, which may create conflicts. For instance, a significant minority of health care providers see their authority challenged by the abundance of health information accessible via digital media, perceive a deterioration in the physician-patient relationship as a result, and fear a negative impact on the quality of health care or health outcomes, although most embrace the shift brought about by technology from a paternalistic to a partnership model of health care.⁸⁸ Parents may be similarly irritated when their children search for information on birth control on the Internet, for instance, rather than discussing this with them or with a physician. In this way, the DIDA also helps to explain some of the perceptions and frustrations that intermediaries often have with the disintermediation process, as they tend to see predominantly the “failures,” for instance, patients finding irrelevant or misleading information on the Internet.

Challenges and Limitations of Apomediation

The power shift that occurs during disintermediation creates new challenges for both the intermediary and the newly empowered user and patient. One of the challenges, particularly in the context of health care and youth, is the question of personal relevance, interpretation, and contextualization. Even information that is accurate can be detrimental when applied in the wrong context. In fact, when physicians express discontent about patients bringing stockpiles of Internet printouts into the doctor’s office, the primary complaint is not so much about the quality or credibility of that information in an objective sense, but its irrelevance for the specific patient or potential misinterpretations by the patient. In one survey, 73.8 percent

of general practitioners said that Internet information brought in by patients is generally accurate, and 65 percent even said much of the information was new to them, but only 44.7 percent said that the patient had correctly interpreted the information. A different survey found that those health care providers who thought that much of the information patients brought in was irrelevant also had more negative views on how the patient–physician relationship was affected by such information.⁸⁹ This is not surprising, because contextualizing and interpreting information is one of the key roles of intermediaries, especially in the health care context. Moreover, contextualizing and interpreting information is likely a bigger challenge for youth than for adults, owing to limited life experience, education (in the case of younger youth), as well as limited functional health literacy and topical knowledge.⁹⁰ That said, however, older youth may benefit from higher levels of computer and new media literacy, greater free time, their natural curiosity and persistence, and a strong network of peers, with whom they stay connected through digital technology such as instant messaging, social networking, and other applications,⁹¹ which may help to compensate for young people’s knowledge and experiential deficits.

Given this picture, it is a curious omission from the literature that the degree to which apomediaries actually succeed in the same way as intermediaries, such as physicians or parents, in filtering and interpreting health information is largely unexplored. While there have been data on the “self-corrective” nature of digital media, for example, that inaccurate statements on mailing lists are corrected by peers⁹² and studies of the relative accuracy of Wikipedia,⁹³ little is known to what degree apomediation helps to filter *relevant* information and to contextualize that information. There is tremendous opportunity for research on this topic.

In addition, various apomediation tools such as “tabulated” credibility⁹⁴ have further significant limitations, in that they may lead to the promotion of opinion rather than fact. As Grohol notes, “Even if a website collates a bunch of people’s opinions and gives them numbers, that doesn’t elevate the information presented to ‘fact.’ It is still opinion. And such opinion is no substitute for medical advice, professional advice, or an empirical research study.”⁹⁵ To illustrate this point, Grohol presents the example of a Web site that allows members to rate medication. If a user sees that 90 percent of members report that a certain medication gives them a headache, they will likely conclude that they should avoid taking that medication. That conclusion may be false, however, since the data presented on the Web site say nothing about how well the sample is representative of the population or whether the medication can plausibly be linked to headaches. He writes, “Headaches are very common in the general population—everyone gets them. Randomized controlled research studies have methods in place to measure whether a symptom is likely caused by a specific medication or not. Generally people’s website self-reports, however, do not have such careful data collection methods.”

Of course, medication-rating Web sites do actually exist (e.g., askapatient.com). Few adverse effects have been noted, perhaps because, if used correctly, such systems merely complement and do not necessarily replace interactions with an intermediary. As discussed earlier, intermediaries do not necessarily disappear, but can remain an actor in the apomediation network, even if their roles have changed. Indeed, narrative, experiential-based information, if interpreted correctly, should be seen as a valuable complement to information from health care intermediaries or from scientific studies. However, the question of whether and to what degree patients are actually misled by rating or recommender systems is important, as is the question of to what degree the success of apomediation systems is domain-dependent (i.e.,

should the same apomediation tools that seem to work in entertainment and other areas be used in health care?).

Credibility Implications of Disintermediation/Apomediation

The shift from intermediaries to disintermediation/apomediation has implications for several credibility constructs. Some credibility implications include the hypothesis that there is an association between apomediation/intermediation and the way credibility is evaluated, the hypothesis that credibility of a specific message might be boosted through disintermediation/apomediation, the notion that disintermediation/apomediation may help to reinstate trust in intermediaries, the prominence of experiential information in apomediated environments, and the idea of applying network theory to apomediation networks to develop new tools to direct consumers to credible information. Each will be considered in turn below.

Correlations between Apomediation/Intermediation and Credibility Assessment

How people evaluate credibility is likely to be different in an apomediated environment than in an intermediated environment and is probably related to their preference for one or the other. Specifically, within intermediated environments, information is prefiltered by the gatekeeper or authority and is presented as credible to users. With disintermediation, apomediators provide users *guidance* in locating and evaluating information. With this in mind, it is hypothesized that people who possess or desire greater autonomy, be they mature teenagers, people with chronic illnesses, or anyone else, will prefer apomediation as an approach to determining credibility. As a consequence of relying less on “authorities” and more on peers, it is further hypothesized that message credibility will be more important than source credibility for these people. Furthermore, people using an apomediation approach to credibility assessment are probably more prone to employ a “spectral evaluation” rather than a “binary evaluation” approach, acknowledging “shades of grey” rather than “black and white” answers.⁹⁶

By contrast, people choosing an intermediary are likely to be those who are less autonomous and as a result need or want authoritative answers from traditional intermediaries. These people could include, for example, younger children, older seniors, incapacitated or illiterate people, or people with acute diseases or in other “new” situations. In this situation, more emphasis is likely placed on source credibility. These hypotheses come with some important limitations that will be discussed below, and it should also be acknowledged that within each environment, considerable interindividual and intersituational variation exists in terms of what credibility evaluation strategies are employed. For example, time constraints, technical abilities, and motivation will affect people’s credibility evaluation strategies.

These considerations are grounded in the observation that several variables that predict an individual’s preference for disintermediation/apomediation, including *autonomy*, *self-efficacy*, and *knowledge*, are also correlated with an individual’s *motivation* and *ability* to process messages and influence credibility judgments. According to the elaboration likelihood model (ELM) of persuasion,⁹⁷ higher motivation (which is affected by a person’s involvement with an issue, including knowledge and personal relevance of some topic) and ability (a person’s cognitive abilities, degree of literacy, or time available) will lead to more effortful processing of a message, while lower motivation and ability will privilege an evaluation of environmental characteristics of the message, such as the attractiveness or qualifications of

the source, or message presentation elements, as primary credibility cues. Fogg and Tseng⁹⁸ extend this model to hypothesize that people with lower motivation and ability are more likely to adopt a binary evaluation strategy (i.e., something is “credible” or “not credible”), whereas people with higher motivation and ability employ a spectral evaluation strategy. If we accept that in most cases autonomy is positively correlated with general motivation and ability, and if we accept that these variables also predict whether or not somebody prefers a disintermediation/apomEDIATION approach to credibility assessment, then the argument presented here is plausible.

Of course, these very general predictions that may characterize broad trends come with important limitations and exceptions, such as the fact that the model only works if people have a choice between seeking an intermediary or not. For example, if disintermediation occurs as a result of the intermediary not being available, the user is forced into an apomEDIATION model regardless of whether the prerequisite “autonomy” is present. Also, the way in which the credibility of a message is evaluated is primarily determined by the situation, since the environment (intermediation or disintermediation/apomEDIATION) in which individuals find themselves cannot always be controlled. In other words, in practice it may be easier to “switch” between evaluation strategies than between environments.

This gives rise to situations where intermediaries are used, but motivation and ability of the receiver are high, creating an apparent contradiction with the argument that autonomous (motivated and knowledgeable) individuals will prefer apomEDIATION and employ the credibility evaluation strategies outlined above. For example, educated (i.e., able) and motivated cancer patients who seek out a health professional (intermediary) might prove an exception to the rule as they likely screen message credibility carefully, as well as employ a sophisticated spectral evaluation approach despite using an intermediary. Two explanations are possible: First, one could argue that the primary reason for relying on the intermediary in this case is for treatment rather than informational purposes. Second, information needs, information-searching behavior, and credibility-assessment strategies of patients evolve and change during the course of their care,⁹⁹ and thus the notion that patients with severe illnesses always have high motivation and ability may be an oversimplification. In particular, motivation and ability are often low immediately after diagnosis (due to fear and denial), but then increase over time.¹⁰⁰

Boosting Credibility through Disintermediation

“Direct” or unmediated information is often perceived as more credible than mediated information because mediation through a gatekeeper brings “greater opportunity to impute motives and intentions of the communicator.”¹⁰¹ As such, disintermediation has the potential to increase the perceived credibility of information, especially under circumstances where the intermediary is perceived as not completely neutral or where the credibility of the gatekeeper is unclear or questionable. This is particularly relevant in the health care system, where doctors are often paid per service by insurance companies or governments, and where payers are under considerable cost pressures, leading to a perceived rationing of available services.

Against this background, many consumers mistrust intermediaries, which are seen as part of a flawed system and not neutral. For example, many consumers view the traditional health care system as being biased against alternative medicine, as health care professionals are incentivized to offer expensive therapies for which they are reimbursed more generously, as opposed to therapies which are “natural” but for which they cannot charge much.¹⁰²

Such mistrust creates the desire to bypass the intermediary, and boosts trust in information that has been received from other sources. Under this logic, it is possible that a sufficiently autonomous patient who receives information through a health professional may have bigger concerns about its credibility than another patient who finds the identical information independently from an intermediary on the Internet. In addition, the very fact that in digital apomediated environments information usually has to be more actively pursued rather than just being provided by an intermediary, may increase its salience, which in turn may lead people to attribute more importance to that information.¹⁰³ While youth are unlikely to rationalize their mistrust of traditional health intermediaries in this way, questioning and mistrusting traditional authorities is a natural part of adolescence, and information mediated through traditional authorities such as parents, teachers, and even health care professionals may be perceived as biased. Information from trusted peers who are experiencing the same health concerns or experiences, on the other hand, may in fact be seen as more credible. This may be particularly true for information on sensitive topics related to sex, alcohol, or drugs, which constitute a good proportion of the health information that teens seek.

Reinstating Trust in the Intermediary

It can also be hypothesized that intermediaries who voluntarily “step aside” to allow and facilitate consumers’ direct access to information and participation in services can help to reinstate trust in the intermediary, provided that the consumer possesses the respective desire for autonomy and the abilities to cope with that information. For example, health professionals who actively encourage patients to access their own health records (electronically or otherwise) can help to restore patients’ trust in the medical system.¹⁰⁴ However, this works only if information provided through more direct channels is not perceived as contradictory to the information provided by the intermediary. If that is the case, recipients may attribute the discordance to intermediary bias, thus undermining the trust relationship. For example, youth accessing information on issues of sexuality through the Internet may lose trust in parents and teachers if the information found through the apomediated channels contradicts the information provided by intermediaries.

The principle of “trust your users to gain trust” can also be exemplified by the success of recent Internet tools such as wikis or blogs, and by online companies and services that have employed a “trust your users” philosophy, such as Amazon, ePinions, eBay, YouTube, MySpace, and the like. While the traditional dogma on the Web was creating trust and quality through tightly controlled editorial content management, the new emerging philosophy is to allow and encourage participation and content creation by users with little or no “upstream” barriers.

The Importance of Experiential Information in Apomediated Environments

While traditional wisdom from credibility research suggests that perceived accuracy is a hallmark for message credibility,¹⁰⁵ it would be a mistake to assume that accuracy only refers to evidence-based information based on research, or that this type of information would automatically have more credibility for health consumers than do anecdotes. In a focus group with patients, Glenton and colleagues found that people “often made treatment decisions in a context of great pain and despair,” which left them with little energy to perform laborious information searches or to care what the research said.¹⁰⁶ “Instead, they often gathered information about treatments through the personal anecdotes of friends and neighbors, and, in most cases, this experience-based information was considered to be more

relevant than the evidence-based information." Not only can experiential information from apomediaries and peers be more *relevant* for patients, it may also be perceived as more or at least equally *credible* as information based on scientific research.

Similarly, the notion that source expertise is communicated primarily through author credentials is not always true in the health care context. Here, "expertise" is not only expressed by such credentials as professional degrees and qualifications, but also by firsthand experience. Thus, experience-based credibility can be seen as an additional dimension of source credibility.¹⁰⁷ Source credibility research finds that similarity in attitudes with a speaker positively influences credibility perceptions.¹⁰⁸ By extension, similarity of experiences (similarity of symptoms, diagnoses, etc., in the health care context) also contributes to credibility perceptions. In the context of youth, this idea is expressed by the term *street credibility*, which is defined as "commanding a high level of respect in a certain environment due to experience in or knowledge of issues affecting that environment."¹⁰⁹

Applying Network Theory to Apomediaries: Credibility Hubs

Apomediaries can be seen as highly complex networks of individuals and tools guiding consumers to credible information. Networked environments are typically seen as more equitable and democratic in structure compared to hierarchical environments, where a relatively small set of intermediaries holds most of the power. However, network theory¹¹⁰ teaches us that most networks turn out not to be random networks in which all nodes have roughly the same number of links, but instead are scale-free networks, where a rich-gets-richer phenomenon leads to the emergence of highly connected nodes, called "hubs." Hubs emerge in scale-free networks because of growth (i.e., the continued addition of new nodes or actors) and preferential attachment of links to nodes that already have more links.¹¹¹ In the context of this chapter, these hubs can be called *credibility hubs*. Credibility hubs are highly connected and influential nodes (e.g., "opinion leaders"), and are partly a result of what Sundar¹¹² calls the bandwagon heuristic of credibility assessment ("If others think something is good, then I should think so too"). The implication is that not all apomediaries are equal; there is likely to emerge a small number of highly influential nodes whose recommendations carry more weight in influencing credibility perceptions.

Interestingly, former intermediaries may initially have a good chance of becoming a credibility hub, because they are already well connected. For instance, a professional medical organization has a preexisting social network that leads to other organizations' linking to their Web site, leading their Web site to appear at the top of Google search results, making the Web site appear more credible, which in turn leads to more people to link to it, and so on. An interesting psychological phenomenon that may help to create credibility hubs through a rich-gets-richer mechanism is that people attribute statements they believe to credible sources. For example, participants in an experiment who were exposed to a statement many times not only came to believe the statement, but were also likely to attribute it more often to *Consumer Reports* (a credible source) than to the *National Enquirer* (a not-so-credible source).¹¹³ Such psychological mechanisms may further increase the trustworthiness of often-cited sources.

Despite the fact that former intermediaries may initially have a better chance of becoming credibility hubs in an apomediation network, network theory also shows that entirely new hubs may emerge with relative ease,¹¹⁴ making the landscape much more fluid than in an intermediation environment, where credibility hubs tend to be relatively static. In any case, there is tremendous opportunity to analyze apomediation networks not only for

research purposes, but also to develop tools that can help guide consumers to trustworthy information. Semantic Web tools, which allow machine-processable descriptions of trust relationships, combined with social network analysis, have been proposed as a possible approach to develop “intelligent” applications that enable consumers to find credible health information on the basis of what a network of actors says about other actors,¹¹⁵ and there is now an emerging area of research looking at the question how trust relations in Web-based social networks can be modeled, calculated, mined, and integrated into applications.¹¹⁶

New Perspectives on Source and Message Credibility

As the previous section argued, the shift from intermediaries to apomediaries has implications in terms of how people assess credibility and what is deemed credible. Moreover, this shift from a gatekeeper/singular authority environment to a network environment where people are guided to information through others/multiple authorities, perhaps even constitutes a paradigm change for users and for researchers, whose thinking is still primarily influenced by the old intermediary model. The following section explores some new perspectives on source and message credibility in networked digital environments.

Source Credibility in a Networked World

Source credibility is traditionally seen as a cornerstone of credibility judgments. A piece of health information attributed to a high school freshman can appear less credible than the same piece of information attributed to a medical expert, in particular if the message receiver has limited knowledge of the topic discussed.¹¹⁷ A number of quality instruments and credibility checklists for content producers refer to the provision of authors’ names as an ethical tenet, as well as a predictor for “quality” information.¹¹⁸ However, there are considerable problems in defining author or “source” in the digital environment.¹¹⁹ In fact, aspects of the technology may cause users to pay less attention to and assign less weight to source cues than they do to message cues when determining credibility than they do in intermediated environments. Fogg’s prominence-interpretation theory supports this view, claiming that credibility is a product of the prominence and interpretation of credibility cues.¹²⁰

In digital environments, source cues may be less prominent than in traditional media or face-to-face interactions, owing to the difficulties in determining who the source is in digital media environments and the relative paucity of source cues on many Web sites. As a result, it may actually be easier for the user to try to corroborate the message, for example by clicking on the first hits in a search engine, to see what multiple people have to say, rather than investigating in-depth each specific site for its source(s) and source credentials. Ironically, some users even praise the relative “source anonymity” on the Internet as an advantage of the medium, as illustrated by the following quote of a teenager, who said on the Internet “people can meet people and share their ideas without their race, religion, or physical attractiveness becoming a factor. This optional facelessness allows true freedom and interaction without bias.”¹²¹ What the teenager implies is that, ideally, people should focus on the message rather than the source, especially if there is reason to believe that source attributes may unfairly negatively influence message acceptance by the receiver. By extension, teenagers striving for autonomy may appreciate the fact that the Internet allows them to conceal their age, as it may detract from their credibility in adults’ eyes.

Second, in terms of users’ interpretation of credibility cues, digitally sophisticated users (and youth in particular) may be well aware that on the Internet, credentials suggesting

expert status can be easily misrepresented, as can identities, making interpretation of source cues difficult. Hence, users may intuitively feel that even if they would investigate source expertise cues, the legitimacy of those cues would still remain questionable. Indeed, many young people have multiple online identities themselves: A Pew survey in 2000 found that 56 percent of teens reported having more than one screen name or e-mail address, 24 percent have pretended to be someone else online, and 33 percent have lied about themselves for various purposes, some to gain access to age-restricted Web sites.¹²² Most users are also aware that it is relatively easy to misrepresent expert status online. The fact that anyone with sufficient technological access and skill can create a Web site and claim to be an expert on a topic is well known. Thus, sophisticated users will cross-check facts rather than rely on asserted claims of expert status. This observation is grounded in empirical work¹²³ that shows that consumers collect bits and pieces of information from different Web sites without necessarily paying a lot of attention to who authored each information bit.

In summary, young people may not spend a lot of energy looking at authors' names and verifying source expertise. Although additional research is required to resolve the various dimensions of source credibility today, the influence of visible source credibility cues that can be easily interpreted such as brand name recognition,¹²⁴ surface credibility,¹²⁵ site design,¹²⁶ concordance of the message when obtained from different sources,¹²⁷ and perhaps apomediary credibility (as discussed next) are all important to consider today.

Apomediary Credibility

Apomediaries are human or technological agents that guide users to trustworthy sources and messages by, for example, recommending certain sources or messages. Apomediaries themselves are not necessary to obtain that information, in contrast to the more traditional intermediary model. Intermediaries are often conceptualized as the "source" (although in many cases they just mediate between the true source and the recipient, as, for example, do journalists), and as such, most of the source credibility literature deals with the credibility of the intermediary.¹²⁸ Apomediaries, on the other hand, should not be conceptualized as sources because they are recommenders or referrers to other sources. That said, however, the credibility of the apomediary certainly has an influence on perceptions of the credibility of the recommended source.

Consumers may evaluate the trustworthiness of various apomediaries differently, depending on whether they are humans or electronic tools. For some types of apomediaries, people may rely largely on community mechanisms to sort out less trustworthy members, such as friends, peers, or users of electronic rating and recommender systems where the reputation of the user is measured (e.g., Slashdot's "karma" mechanism). In this situation, access to or standing within the community are the primary conveyors of trust. This type of credibility assessment may be particularly appealing to younger Internet users, given their popularity and apparent comfort with social networking via digital media. However, whether or not these mechanisms are effective is unclear.

Message Credibility

Message credibility is commonly seen as being associated with attributes such as perceived message accuracy and completeness. However, the relationship between message "quality" attributes such as accuracy and completeness and perceived message credibility is not simple or linear.¹²⁹ Consequently, developers of health information designed for public

dissemination should not assume that all they have to do is make their information “accurate” and complete in order for users to find it credible.

Relationship between Accuracy and Perceived Message Credibility

According to Fogg, credibility is an inherently subjective concept that is created from an individual’s interpretation of various source, media, and information elements.¹³⁰ The subjectivity of credibility interpretations implies that different audiences may perceive the same information from the same source to be differently credible, supporting the notion that accuracy and completeness are not necessarily predictors of message credibility. Indeed, evidence-based health information provided by sources with the best credentials can be perceived as not credible as when, for instance, an otherwise high-quality Web site delivering evidence-based information is negatively affected by bad design and navigational issues (broken links, etc.). In addition, research has shown that evidence-based health information may not be trusted by some because of negative attitudes and mistrust toward research and researchers as the source of information.¹³¹

While it is sometimes easy to spot blatantly inaccurate information, in medicine there are often “grey” areas with no “correct” answer. This reality is not always understood by laypersons, who may expect that there is a clear-cut answer to most medical questions. In fact, there may even be an inverse relationship between accuracy (in a sense of truthfulness to the facts as found in clinical research) and perceived credibility: For many medical problems, a vast body of conflicting evidence exists, and if all the contradictions and scientific uncertainty were “accurately” represented by a physician or on a Web site, many patients would be more skeptical than trusting, since uncertainty negatively affects credibility.¹³² By contrast, sources that give simple, unconditional, nonconflicting information, even to the point of oversimplifying things to the extent that they really cannot be called “accurate,” may appear more credible, at least for people who adopt a “binary” evaluation strategy as described earlier.¹³³

Although it would be nice to be able to measure the relationship between actual and perceived message accuracy, research on the quality of health information on the Internet has revealed significant methodological difficulties in measuring the “actual” accuracy and comprehensiveness of online health information in an objective and reliable manner.¹³⁴ One common methodology used to assess accuracy and comprehensiveness is to extract facts from evidence-based clinical guidelines and to check whether these facts are present or absent on a health Web site. While the gold standard of accuracy is “evidence-based medicine,” in many cases the evidence is poor or conflicting, and it may be difficult or impossible to determine the “truth.” Even in the presence of clinical guidelines, standards for medical practice often vary regionally, signalling yet another problem for a global medium.

A related problem is that no clear standards exist on how, or how much, medical information should be conveyed to consumers. Questions such as the degree to which and how information should be simplified, and how to best communicate risks are hotly debated. In reality, then, quality of content can only be determined if there is a clear answer to a medical question and if there is an evidence base that says how to best convey this information to consumers. Unfortunately, both of these elements are often absent in the medical literature. It is not surprising, then, that patients sometimes seek, and have more trust in, experiential information from peers, rather than information based on research. On the Internet, experiential information is by far more prevalent than research information. It is important for consumers to realize, however, that while anecdotes are “accurate” representations of a

single person's experience, they may not be generalizable, reliable, or applicable, which is why anecdotes are generally dismissed by physicians as a basis for medical decision making. However, they remain "accurate" information at some level, and it is still an open question to what degree the body of "opinions" and "experiences" on the Internet conflicts with the research evidence, and to what extent it may be misleading or helpful for patients.

Completeness in a Hyperlinked World

"Comprehensiveness" or "completeness" of content is an important quality criterion used by information scientists¹³⁵ and evaluators of health information on the Internet.¹³⁶ It is also important from the point of view of a commercial health information provider, who generally aims to keep consumers on their Web site, avoiding links to other Web sites and often striving to provide a broad scope of information to enhance "stickiness" and credibility of the Web site. Some empirical work shows that the more information provided, the more a Web site is trusted by consumers.¹³⁷ This is perhaps a result of promoting "comprehensiveness" as a quality or credibility criterion in the literature, or more likely is a result of people being easily impressed by an information-filled page or site, and inferring authority from the pure volume of information.

However, from the point of view of a user, public health researcher, or policy maker, completeness of a given single Web site in a networked world may not be of primary importance, as long as further information can be easily found on other Web sites. This is because people typically gather information from various sites and complementary information is often only a mouse-click away.¹³⁸ From the user's perspective, there may be nothing wrong with a Web site that deals with one narrow topic in depth (e.g., treatment options for a particular health condition) but that provides links to other sites with additional information rather than providing "comprehensive" information about a disease (e.g., epidemiology, diagnosis, prognosis, and treatment). In fact, it has been shown that some people trust specialists more than generalists¹³⁹ owing to their presumed deep knowledge, highlighting that "comprehensiveness" or "completeness" should not be misunderstood as coverage of a broad scope of topics.

In sum, while information completeness may be a valid concern in the offline world, consumers in the networked, hyperlinked world are not necessarily looking for the "one-stop shopping" Web site. Part of the attractiveness of the Internet is in fact its diversity. While consumers do look for convenience, and some have difficulty searching and finding information on the Internet, much of the younger generation will likely not perceive clicking from site to site as a major inconvenience. As a consequence, content developers should not necessarily always strive for completeness, particularly when information that is outside their particular content expertise is covered on other sites, and educators should not necessarily promote completeness as a definitive quality criterion in this context.

Language and Message Credibility

High-quality and credible health Web sites targeted to youth may also have some special requirements concerning language. While "professional" language has been mentioned by adults as a marker for credibility,¹⁴⁰ age-appropriate nonpatronizing language is important to engage kids and will likely enhance the "street credibility" of the content producer. Young people may not be persuaded by material that "preaches" in an adult voice, especially in sensitive health areas involving sexual or drug-related information. Again, there are parallels to what "autonomous" adults prefer, who also have a dislike for patronizing, "doctors know

it best” language.¹⁴¹ The implication is that language should be tailored to the autonomy level of the audience to positively influence users’ credibility judgments.

Next-Generation Education Assessment Tools

A recent review of 273 instruments designed for patients and consumers to assess the credibility of health information concluded that “few are likely to be practically usable by the intended audience.”¹⁴² Most of these tools are simple checklists, reflecting the observation made earlier that many tools and perspectives on credibility do not adequately take into account the unique features of a digital networked environment. A prime example is the DISCERN instrument, which was developed for printed patient education brochures¹⁴³ but is advocated as a tool to be used in the Internet context.¹⁴⁴ While aspects of these tools may well be useful in the networked world,¹⁴⁵ as also shown for DISCERN,¹⁴⁶ there is a shortage of tools that specifically exploit the strengths of the Internet.

A second generation of educational tools that takes the networked digital environment into account is required. Educational and technological tools should capitalize on the advantages of networked environments, which include the ability for users to rely on multiple sources of information, to cross-check information on other Web sites, and to verify the credibility and reputation of the source using the Web itself. As Meola notes, rather than promoting a mechanistic way of evaluating Internet resources, a contextual approach is needed, which includes reminding users that they can and should corroborate information on the Web.¹⁴⁷ It is exactly those techniques and processes that should be taught and reinforced through process-oriented applications and tools.

An example of such a second-generation educational tool—though certainly still in need of improvement—is the FA4CT (or FACCCCT) algorithm, developed in the context of an Internet “school” for cancer patients.¹⁴⁸ FA4CT is intended for use by consumers to find and check medical facts on the Internet in three steps: (1) *Find Answers and Compare* from different sources, (2) *Check Credibility*, and (3) *Check Trustworthiness* (reputation). To use FA4CT, consumers who seek information on the Web are instructed to first formulate their medical question as clearly as possible, preferably in a way that allows a yes/no answer. They are then instructed to translate this question into search terms and to conduct an initial Google search query to locate three Web sites that contain an answer to their question. If there is no consensus in the three answers provided, each Web site is evaluated for credibility by checking the currency of the information, its use of references, determining the site’s explicit purpose, disclosure of sponsors, interests disclosed and conflicts found, how balanced the information appears to be, and the level of evidence provided for claims. These criteria are based on empirical studies and reflect markers that have been shown to predict information accuracy.¹⁴⁹ If after elimination of less reliable Web sites there is still no consensus, users are asked to enter the name of the source into Google to check what others on the Web have to say about that source, in an effort to arrive at a reputation score.

Cross-checking of facts as a strategy does have its limitations and, apart from one small study,¹⁵⁰ there is limited evidence demonstrating that this strategy is indeed suitable to find “accurate” information. There are also potential pitfalls to this strategy including misinformation, rumors, and myths that may spread as fast as credible information on the Internet. Moreover, because information may be mirrored or “syndicated” simultaneously on hundreds of Web sites, it may falsely appear to support a fact from multiple perspectives, while in reality a single source is responsible for the content. Perhaps the biggest threat in applying

the cross-checking strategy is that if consumers do not formulate their queries in a neutral way, they will find mainly information that supports their own preconceived view (as discussed earlier). Thus, a certain degree of Internet literacy is required to implement this strategy effectively and, ideally, promoting the strategy of corroboration should be combined with educating users how to perform unbiased searches as well as how to avoid other potential pitfalls. Finally, more general limitations of process-oriented approaches include that such processes and techniques are time-intensive and cognitively demanding.

Conclusion

This chapter argues that digital media technologies have caused a paradigm shift in the ways in which people, both young and old, seek and find health information that they consider credible. As a result of disintermediation, traditional intermediaries are being both complemented and replaced by “apomediaries,” who stand by consumers to guide them to trustworthy information, and/or provide credibility cues for information or sources. Table 1 summarizes the differences between intermediary and apomediary environments.

It is further argued that different degrees of desire, ability, and actual autonomy are related to the preference for an apomediated versus intermediated information environment. In particular, the chapter draws analogies between the technological disintermediation process afforded by digital media, and the naturally-occurring disintermediation process that takes place during adolescence. Both processes reflect the desire of e-consumers and adolescents to, under certain circumstances, emancipate themselves from traditional authorities, and to gain and maintain autonomy. While the disintermediation and emancipation processes are enabled, supported, and reinforced by digital media, in both cases information recipients have to reach a certain degree of cognitive ability, prior knowledge, self-efficacy, and autonomy to use them effectively.

Of course, none of these correlations are absolute and, in many cases, information consumers will dynamically switch back and forth between intermediated and apomediated environments, as well as use them simultaneously. However, the journey through adolescence and the journey of a chronic disease patient are two situations where profound shifts in autonomy typically occur, with consequences for how credibility is assessed throughout this continuum.

Indeed, another premise of this chapter is that these environments affect how credibility is assessed. It is hypothesized that with disintermediation, tools, influential peers, and opinion leaders become more important. As such, the recommendations of apomediaries may become equally or more important than source credibility as it has been defined traditionally. This is not to say, however, that visible and easy-to-interpret source cues, including brand names, will not continue to affect credibility perceptions in the online world. Rather, they will likely be one of many credibility cues that information seekers will consider, and may become less important as the cues provided by apomediaries, perhaps especially for younger information seekers who may be more comfortable using the social networking potential afforded by digital media.

On the basis of these ideas, the chapter suggests that the tools of network analysis may be useful in studying the dynamics of apomediary credibility in a networked digital world. The networked environment also supports the evaluation of messages, in addition to sources, through cross-checking of facts from multiple sources. One concern arising from the apomediated environment is that it may promote “mass opinion” more than “fact,” making

Table 1
Dichotomies in intermediation versus apomediation environments.

Dimension	Intermediation Environment	Disintermediation/Apomediation Environment
<i>Overarching Issues</i>		
Environment	Managed	Autonomous
Power	Centralized; power held by intermediaries (experts, authorities)	Decentralized; empowerment of information seekers and youth
Dependence	Information seekers dependent on intermediaries (physicians, parents); intermediaries are <i>necessary</i>	Information seekers are emancipated from intermediaries as apomediators (peers, technology) provide <i>guidance</i> ; apomediators are <i>optional</i>
Nature of Information Consumption	Consumers tend to be passive receivers of information	Consumers are “prosumers” (i.e., coproducers of information)
Nature of Interaction	Traditional 1:1 interaction between intermediary and information seeker	Complex individual- and group-based interactions in a networked environment
Information Filtering	“Upstream” filtering with top-down quality assurance mechanisms	“Downstream filtering” with bottom-up quality assurance mechanisms
Learning	More formal; learning through consumption of information	More informal; learning through participation, application, and information production
Cognitive Elaboration	Lower cognitive elaboration required by information receivers	Higher elaboration required by information seekers; higher cognitive load unless assistance through intelligent tools
User	More suitable for and/or desired by preadolescents, inexperienced or less information-literate consumers, or patients with acute illness	More suitable for and/or desired by older adolescents and adults, experienced or information-literate consumers, or patients with chronic conditions
<i>Credibility Issues</i>		
Expertise	Based on traditional credentials (e.g., seniority, professional degrees)	Based on first-hand experience or that of peers
Bias	May promote facts over opinion, but opportunity for intermediary to introduce biases	May bestow more credibility to opinions rather than facts
Source Credibility	Based on the believability of the source’s authority; source credibility is more important than message credibility	Based on believability of apomediators; message credibility and credibility of apomediators are more important than source credibility
Message Credibility	Based on professional and precise language, comprehensiveness, use of citations, etc.	Based on understandable language, knowing or having experienced issues personally
Credibility Hubs	Static (experts)	Dynamic (opinion leaders)
Credibility Evaluations	Binary	Spectral

credibility a popularity contest, and that this may be particularly hazardous in the medical context given its special nature and consequentiality.

The ideas raised in the chapter also indicate practical implications of the apomediation model for developers of digital information and media, such as health Web sites geared

specifically for children. Governments and other traditional authorities, while certainly having credibility due to brand name recognition, do not typically do a very good job of creating credible health Web sites for youth because they nearly always look and sound like government Web sites, and they lack the “street credibility” to keep many youth engaged with the site or message. Under the rubric developed in this chapter, good Web sites for youth should allow young people to share their voices and connect with others in a safe, positive, supportive, moderated, online community. They should allow youth to be creators of content, rather than conceive of them as merely an audience to “broadcast” to. Engaging and credible Web sites are about building community, and communities are built upon both personal and social needs.

Finally, this chapter points out that some of the core dimensions of message credibility as traditionally conceived, such as message “accuracy” or “completeness,” are problematic in a domain such as medicine, where accuracy or completeness are difficult or impossible to measure objectively. Rather, it is suggested that evaluations of the accuracy of a message in this context are primarily a function of user needs and expectations. This opens some new perspectives for enhancing the credibility of online health messages. Unlike traditional media, digital media allow mass-customization to recipients’ needs and expectations, as well as individual tailoring of message content.¹⁵¹ What has been done to a lesser degree is tailoring credibility cues that can be used to increase the persuasiveness of the message. Such message tailoring can be equally useful for adult and youth health information seekers, as it takes into account different developmental levels and different levels of autonomy. More sophisticated educational tools that take into account the advantages afforded by digital media are required to help consumers find the information they need to become healthier individuals.

Notes

1. Susannah Fox and Deborah Fallows, Internet Health Resources, 2003, http://www.pewinternet.org/pdfs/PIP_Health_Report_July_2003.pdf. Archived at: <http://www.webcitation.org/5I2STSU61>.
2. Ibid., p. ii.
3. Statistics Canada, Household Internet Survey, 2003, <http://www40.statcan.ca/I01/cst01/comm09a.htm?sdi=internet>. Archived at: <http://www.webcitation.org/5I2fNukJs>.
4. Susannah Fox and Mary Madden, Pew Data Memo, Generations online, 2005, http://www.pewinternet.org/pdfs/PIP_Generations_Memo.pdf. Archived at: <http://www.webcitation.org/5MGIFTboq>.
5. Amanda Lenhart, Mary Madden, and Paul Hitlin, Teens and Technology: Youth Are Leading the Transition to a Fully Wired and Mobile Nation, July 27, 2005, http://www.pewinternet.org/pdfs/PIP_Teens_Tech_July2005web.pdf. Archived at: <http://www.webcitation.org/5NBw8JH3M>.
6. Victoria Rideout, Generation Rx.com: How Young People Use the Internet for Health Information, 2001, <http://www.kff.org/entmedia/upload/Toplines.pdf>. Archived at: <http://www.webcitation.org/5I8qkguFL>.
7. Greg Pass, Abdul Chowdhury, and Cayley Torgeson, A Picture of Search, 2006, <http://www.ir.iit.edu/~abdur/publications/pos-infoscale.pdf>. Archived at: <http://www.webcitation.org/5I2Tms4Qk>.
8. Donald L. Patrick, J. W. Bush, and Milton M. Chen, Toward an Operational Definition of Health, *Journal of Health Social Behavior* 14 (1973): 6–23.
9. Lenhart, Madden, and Hitlin, *Teens and Technology*, 42.

10. Gunther Eysenbach and Christian Köhler, What Is the Prevalence of Health-Related Searches on the World Wide Web? Qualitative and Quantitative Analysis of Search Engine Queries on the Internet. *Proc AMIA Annual Hall Symposium* (2003): 225–29; Gunther Eysenbach and Christian Köhler, Health-Related Searches on the Internet, *JAMA: The Journal of the American Medical Association*, 291 (2004): 2946; Amanda Spink, Yin Yang, Jim Jansen, Pirrko Nykanen, Daniel P. Lorence, Seda Ozmutlu, and H. Cenk Ozmutlu, A Study of Medical and Health Queries to Web Search Engines, *Health Information and Libraries Journal* 21 (2004): 44–51; Pass, Chowdhury, and Torgeson, A Picture of Search.
11. Gunther Eysenbach and Christian Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web? Qualitative Study Using Focus Groups, Usability Tests and In-depth Interviews, *British Medical Journal* 324 (2002): 573–77.
12. Rideout, Generation Rx.com.
13. Mark I. Hainer, Naoky Tsai, Steven T. Komura, and Charles L. Chiu, Fatal Hepatorenal Failure Associated with Hydrazine Sulfate, *Annals of Internal Medicine* 133 (2000): 877–80; Steven D. Weisbord, Jeremy B. Soule, and Paul L. Kimmel, Poison On Line—Acute Renal Failure Caused by Oil of Wormwood Purchased through the Internet [published erratum appears in *New England Journal of Medicine* 337(20) (1997): 1483], *New England Journal of Medicine* 337 (1997): 825–27.
14. Anthony G. Crocco, Miguel Villasis-Keever, and Alejandro Jadad, Analysis of Cases of Harm Associated with Use of Health Information on the Internet, *JAMA: The Journal of the American Medical Association* 287 (2002): 2869–71.
15. Gunther Eysenbach and Christian Köhler, Does the Internet Harm Health? Database of Adverse Events Related to the Internet Has Been Set Up, *British Medical Journal* 324 (2002): 239.
16. Gunther Eysenbach, Gabriel Yihune, Kristian Lampe, Phil Cross, and Dan Brickley, Quality Management, Certification and Rating of Health Information on the Net with MedCERTAIN: Using a medPICS/RDF/XML Metadata Structure for Implementing eHealth Ethics and Creating Trust Globally, *Journal of Medical Internet Research* 2 (2000): (suppl2) e1; Gretchen P. Purcell, Petra Wilson, and Tony Delamothe, The Quality of Health Information on the Internet, *British Medical Journal* 324 (2002): 557–58.
17. Gunther Eysenbach, The Impact of the Internet on Cancer Outcomes, *CA: A Cancer Journal for Clinicians* 53 (2003): 356–71; Thomas Ferguson and Gilles Frydman, The First Generation of E-Patients, *British Medical Journal* 328 (2004): 1148–49.
18. Bradford W. Hesse, David E. Nelson, Gary L. Kreps, Robert T. Croyle, Neeraj K. Arora, and Barbara K. Rimer, Trust and Sources of Health Information: The Impact of the Internet and Its Implications for Health Care Providers: Findings from the First Health Information National Trends Survey, *Archives of Internal Medicine* 165 (2005): 2618–24.
19. Nicola J. Gray, Jonathan D. Klein, Peter R. Noyce, Tracy S. Sesselberg, and Judith A. Cantrill, Health Information-Seeking Behaviour in Adolescence: The Place of the Internet, *Social Science and Medicine* 60 (2005): 1467–78.
20. *Ibid.*, 1472.
21. Michael S. Sabel, Victor J. Strecher, Jennifer L. Schwartz, Timothy S. Wang, Darius L. Karimipour, Jeffrey S. Orringer, Timothy Johnson, and Christopher K. Bichakjian, Patterns of Internet Use and Impact on Patients with Melanoma, *Journal of the American Academy of Dermatology* 52 (2005): 779–85.
22. Kathryn E. Flynn, Maureen A. Smith, and Jeremy Freese, When Do Older Adults Turn to the Internet for Health Information? Findings from the Wisconsin Longitudinal Study, *Journal of General Internal Medicine* 21(2006): 1295–301.

23. Genni M. Newnham, W. Ivon Burns, Raymond D. Snyder, Anthony J. Dowling, Nadia F. Ranieri, Emma L. Gray, and Sue-Ann Lachlan, Information from the Internet: Attitudes of Australian Oncology Patients, *Internal Medicine Journal* 36 (2006): 718–23.
24. Gunther Eysenbach and Thomas L. Diepgen, Patients Looking for Information on the Internet and Seeking Teleadvice: Motivation, Expectations, and Misconceptions as Expressed in E-Mails Sent to Physicians, *Archives of Dermatology* 135:1999: 151–156.
25. Susannah Fox and Lee Rainie, *The Online Health Care Revolution: How the Web Helps Americans Take Better Care of Themselves* (Washington, DC: The Pew Internet and American Life Project, 2000), <http://www.webcitation.org/NVu>.
26. Hesse, et al., Trust and Sources of Health Information.
27. Fox and Rainie, *The Online Health Care Revolution*, 6.
28. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?; Fox and Rainie, *The Online Health Care Revolution*.
29. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?
30. B. J. Fogg, Cathy Soohoo, David R. Danielson, Leslie Marable, Julianne Stanford, and Ellen R. Trauber, How Do Users Evaluate the Credibility of Web Sites? A Study with Over 2,500 Participants (paper presented at the Proceedings of the 2003 Conference on Designing for User Experiences, San Francisco, CA), <http://portal.acm.org/citation.cfm?doi=997078.997097>; C. Nadine Wathen and Jacquelyn Burkell, Believe It or Not: Factors Influencing Credibility on the Web, *Journal of the American Society of Information Science & Technology* 53 (2002): 134–44.
31. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?
32. British Medical Association, Board of Science and Education, Adolescent Health, 2003, [http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFAdolescentHealth/\\$FILE/Adhealth.pdf](http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFAdolescentHealth/$FILE/Adhealth.pdf). Archived at: <http://www.webcitation.org/5LmPtPZ8e>.
33. Matthew Eastin, Toward a Cognitive Developmental Approach to Youth Perceptions of Credibility, this volume.
34. Harvey Skinner, Sherry Biscope, and Blake Poland, Quality of Internet Access: Barrier Behind Internet Use Statistics, *Social Science & Medicine* 57(2003): 875–80.
35. Rideout, Generation Rx.com.
36. Ibid., p. 1.
37. Eastin, Toward a Cognitive Developmental Approach; F. J. Harris, Challenges to Teaching Credibility Assessment in Contemporary Schooling, this volume.
38. Amanda Lenhart, Lee Rainie, and Oliver Lewis, Teenage Life Online: The Rise of the Instant-Message Generation and the Internet's Impact on Friendships and Family Relationships, 2001, http://www.pewinternet.org/pdfs/PIP_Teens_Report.pdf. Archived at: <http://www.webcitation.org/5I8mIrL6f>.
39. Rideout, Generation Rx.com.
40. Lenhart, Rainie, and Lewis, Teenage Life Online.
41. See also Lenhart, Madden, and Hitlin, Teens and Technology, for similar findings.
42. Lenhart, Rainie, and Lewis, Teenage Life Online.

43. Ibid.
44. Andrew J. Flanagin and Miriam J. Metzger, The Role of Site Features, User Attributes, and Information Verification Behaviors on the Perceived Credibility of Web-Based Information, *New Media & Society* 9, no. 2 (2007): 319–42.
45. Nicola J. Gray, Jonathan D. Klein, Judith A. Cantrill, and Peter R. Noyce, Adolescent Girls' Use of the Internet for Health Information: Issues Beyond Access, *Journal of Medical Systems* 26 (2002): 545–53.
46. Rideout, Generation Rx.com; Lenhart, Rainie, and Lewis, *Teenage Life Online*; Lenhart, Madden, and Hitlin, *Teens and Technology*; Gray et al., Adolescent Girls' Use of the Internet.
47. Hesse et al., Trust and Sources of Health Information.
48. Eastin, Toward a Cognitive Developmental Approach.
49. See also Stephen Coleman, Doing IT for Themselves: Management Versus Autonomy in Youth E-Citizenship, in *Civic Life Online*, ed. W. Lance Bennett (this series), for a discussion of the shift from managed versus autonomous environments for teens.
50. Andrew J. Flanagin and Miriam J. Metzger, Digital Media and Youth, this volume.
51. Gunther Eysenbach, An Ontology of Quality Initiatives and a Model for Decentralized, Collaborative Quality Management on the (Semantic) World-Wide-Web, *Journal of Medical Internet Research* 3 (2001): E34.
52. Marc Meola, Chucking the Checklist: A Contextual Approach to Teaching Undergraduates Web-Site Evaluation, *Libraries and the Academy* 4 (2004): 331–44.
53. Derek L. Hansen, Holly A. Derry, Paul J. Resnick, and Caroline R. Richardson, Adolescents Searching for Health Information on the Internet: An Observational Study, *Journal of Medical Internet Research* 5 (2003): e25; Skinner, Biscope, and Poland, Quality of Internet Access.
54. Lana Ivanitskaya, Irene O'Boyle, and Anne M. Casey, Health Information Literacy and Competencies of Information Age Students: Results from the Interactive Online Research Readiness Self-Assessment (RRSA), *Journal of Medical Internet Research* 8 (2006): e6.
55. Eysenbach and Diepgen, Patients Looking for Information on the Internet and Seeking Teleadvice.
56. Ibid.; Flanagin and Metzger, The Role of Site Features; Miriam J. Metzger, Andrew J. Flanagin, Keren Eyal, Daisy R. Lemus, and Robert M. McCann, Credibility for the 21st Century: Integrating Perspectives on Source, Message, and Media Credibility in the Contemporary Media Environment, *Communication Yearbook* 27 (2003): 293–335.
57. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?; John W. Fritch and Robert L. Cromwell, Evaluating Internet Resources: Identity, Affiliation, and Cognitive Authority in a Networked World, *Journal of the American Society of Information Science & Technology* 52 (2001): 499–507; John W. Fritch and Robert L. Cromwell, Delving Deeper into Evaluation: Exploring Cognitive Authority on the Internet, *Reference Services Review* 30, no. 3 (2002): 242–54.
58. Gunther Eysenbach and Thomas L. Diepgen, Towards Quality Management of Medical Information on the Internet: Evaluation, Labelling, and Filtering of Information, *British Medical Journal* 317 (1998): 1496–500.
59. Ibid.
60. See Metzger et al., Credibility for the 21st Century, for a discussion of this issue.

61. Gunther Eysenbach, Towards Ethical Guidelines for E-Health: JMIR Theme Issue on eHealth Ethics, *Journal of Medical Internet Research* 2 (2000): e7.
62. Richard E. Petty and John T. Cacioppo, *Communication and Persuasion: Central and Peripheral Routes to Attitude Change* (New York: Springer, 1986).
63. Elizabeth Murray, Jo Burns, Tai S. See, R. Lai, and Irwin Nazareth, Interactive Health Communication Applications for People with Chronic Disease, *Cochrane Database of Systematic Reviews* (2005).
64. Dean J. Wantland, Carmen J. Portillo, William L. Holzemer, Rob Slaughter, and Eva M. McGhee, The Effectiveness of Web-Based vs. Non-Web-Based Interventions: A Meta-analysis of Behavioral Change Outcomes, *Journal of Medical Internet Research* 6 (2004): e40.
65. See S. Shyam Sundar, this volume.
66. S. Shyam Sundar and Clifford Nass, Conceptualizing Sources in Online News, *Journal of Communication* 51 (2001): 52–72.
67. Gunther Eysenbach, From Intermediation to Disintermediation and Apomediation: New Models for Consumers to Access and Assess the Credibility of Health Information in the Age of Web 2.0., *Medinfo* (in press).
68. Flanagin and Metzger, Digital Media and Youth; R. David Lankes, Trusting the Internet: New Approaches to Credibility Tools, this volume.
69. Gunther Eysenbach and Alejandro R. Jadad, Evidence-Based Patient Choice and Consumer Health Informatics in the Internet Age, *Journal of Medical Internet Research* 3 (2001): e19.
70. Dean F. Sittig, Personal Health Records on the Internet: A Snapshot of the Pioneers at the End of the 20th Century, *International Journal of Medical Informatics* 65 (2002): 1–6.
71. Flanagin and Metzger, Digital Media and Youth; Lankes, Trusting the Internet; Miriam J. Metzger et al., Credibility for the 21st Century.
72. Eysenbach, From Intermediation to Disintermediation and Apomediation.
73. Eysenbach and Diepgen, Towards Quality Management of Medical Information on the Internet.
74. OpenNet Initiative 2004, Internet Filtering in Saudi Arabia in 2004, http://www.opennetinitiative.net/studies/saudi/ONL_Saudi_Arabia_Country_Study.pdf. Archived at: <http://www.webcitation.org/5Ln6EaupR>.
75. Ralph R. Swick and Dan Brickley, PICS Rating Vocabularies in XML/RDF, 2000, <http://www.w3.org/TR/rdf-pics>. Archived at: <http://www.w3.org/TR/rdf-pics>.
76. Wikipedia, 2007, Digg. <http://en.wikipedia.org/wiki/Digg>. Archived at: <http://www.webcitation.org/5Ln8MuQ1g>.
77. Eysenbach et al., Quality Management, Certification and Rating of Health Information on the Net with MedCERTAIN, 2000; Gunther Eysenbach and Thomas L. Diepgen, Labeling and Filtering of Medical Information on the Internet, *Methods of Information in Medicine* 38 (1999): 80–88.
78. Wikipedia, 2007, Web 2.0. <http://en.wikipedia.org/wiki/Web.2.0>. Archived at: <http://www.webcitation.org/5Lq4p8KBG>; Wikipedia, 2007c, Wiki. <http://en.wikipedia.org/wiki/Wiki>. Archived at: <http://www.webcitation.org/5Lq4g3zoO>.
79. Richard Ling, Mobile Communications vis-à-vis Teen Emancipation, Peer Group Integration and Deviance, in *The Inside Text: Social Perspectives on SMS in the Mobile Age*, eds. Richard Harper, Leysia Palen, and Alex Taylor (London: Kluwer, 2005), 175–89.

80. Ibid., p. 187.
81. Lankes, Trusting the Internet.
82. Stephen Russell and Rosalie J. Bakken, Development of Autonomy in Adolescence, 2007, <http://www.ianrpubs.unl.edu/epublic/live/g1449/build/g1449.pdf>. Archived at: <http://www.webcitation.org/5LnwnmVGp>.
83. Of course, this is provided that the individual has actually a choice, which is not always the case.
84. Cameron D. Norman and Harvey A. Skinner, eHealth Literacy: Essential Skills for Consumer Health in a Networked World, *Journal of Medical Internet Research* 8 (2006): e9.
85. Matthew S. Eastin, Credibility Assessments of Online Health Information: The Effects of Source Expertise and Knowledge of Content, *Journal of Computer-Mediated Communication* 6 (2001).
86. Albert Bandura, Self-efficacy: Toward a Unifying Theory of Behavioral Change, *Psychological Review* 84 (1977): 191–215.
87. Eysenbach and Diepgen, Patients Looking for Information on the Internet and Seeking Teleadvice.
88. James G. Anderson, Michelle R. Rainey, and Gunther Eysenbach, The Impact of CyberHealthcare on the Physician-Patient Relationship, *Journal of Medical Systems* 27 (2003): 67–84; Julia M. Brotherton, Stephen J. Clarke, and Susan Quine, Use of the Internet by Oncology Patients: Its Effect on the Doctor–Patient Relationship, *Medical Journal of Australia* 177 (2002): 395; Eysenbach and Jadad, Evidence-Based Patient Choice and Consumer Health Informatics in the Internet Age; Ben S. Gerber and Arnold R. Eiser, The Patient Physician Relationship in the Internet Age: Future Prospects and the Research Agenda, *Journal of Medical Internet Research* 3 (2001): e15; Angie Hart, Flis Henwood, and Sally Wyatt, The Role of the Internet in Patient-Practitioner Relationships: Findings from a Qualitative Research Study, *Journal of Medical Internet Research* 6 (2004): e36; Elizabeth Murray, Bernard Lo, Lance Pollack, Karen Donelan, Joe Catania, Ken Lee, Kinga Zapert, and Rachel Turner, The Impact of Health Information on the Internet on Health Care and the Physician-Patient Relationship: National U.S. Survey among 1,050 U.S. Physicians, *Journal of Medical Internet Research* 5 (2003): e17; Elizabeth Murray, Bernard Lo, Lance Pollack, Karen Donelan, Joe Catania, Martha White, Kinga Zapert, and Rachel Turner, The Impact of Health Information on the Internet on the Physician-Patient Relationship: Patient Perceptions, *Archives of Internal Medicine* 163 (2003): 1727–34.
89. Murray et al., The Impact of Health Information on the Internet on Health Care and the Physician-Patient Relationship.
90. Eastin, Toward a Cognitive Developmental Approach; Nicola J. Gray, Jonathan D. Klein, Peter R. Noyce, Tracy S. Sesselberg, and Judith A. Cantrill, The Internet: A Window on Adolescent Health Literacy, *Journal of Adolescent Health* 37 (2005): 243.
91. Lenhart, Rainie, and Lewis, Teenage Life Online.
92. Adol Esquivel, Funda Meric-Bernstam, and Elmer V. Bernstam, Accuracy and Self Correction of Information Received from an Internet Breast Cancer List: Content Analysis, *British Medical Journal* 332 (2006): 939–42.
93. Jim Giles, Internet Encyclopaedias Go Head to Head, *Nature* 438 (2005): 900–1.
94. Flanagin and Metzger, The Role of Site Features.
95. John Grohol, Reliability and Validity in a Web 2.0 World, 2007, <http://psychcentral.com/lib/2007/01/reliability-and-validity-in-a-web-20-world/>. Archived at: <http://www.webcitation.org/5LqS6tpoe>.
96. B. J. Fogg and Hsiang Tseng, The Elements of Computer Credibility, 1999, <http://captology.stanford.edu/pdf/p80-fogg.pdf>. Archived at: <http://www.webcitation.org/5Lqk5JrrA>.

97. Petty and Cacioppo, *Communication and Persuasion*.
98. Fogg and Tseng, The Elements of Computer Credibility.
99. Lila J. Finney Rutten, Neeraj K. Arora, Alexis D. Bakos, Noreen Aziz, and Julia Rowland, Information Needs and Sources of Information among Cancer Patients: A Systematic Review of Research, 1980–2003, *Patient Education Counselor* 57 (2005): 250–61.
100. Randy Dietrich, HCCAP Founder's Story: Randy Dietrich, 2006, <http://www.hepcchallenge.org/randy.htm>. Archived at: <http://www.webcitation.org/5Ls6kCGHn>.
101. Albert C. Gunther, Attitude Extremity and Trust in Media, *Journalism Quarterly* 65 (1988): 279–87.
102. Claire Glenton, Elin Nilsen, and Benedicte Carlsen, Lay Perceptions of Evidence-Based Information—A Qualitative Evaluation of a Website for Back Pain Sufferers, *BMC Health Services Research* 6 (2006): 34.
103. Donald A. Redelmeier, Eldar Shafir, and Prince S. Aujla, The Beguiling Pursuit of More Information. *Medical Decision Making* 21 (2001): 376–81.
104. Molly Baldry, Carol Cheal, Brian Fisher, Myra Gillett, and Val Huet, Giving Patients Their Own Records in General Practice: Experience of Patients and Staff, *British Medical Journal (Clinical Research Edition)* 292 (1986): 596–98.
105. Metzger et al., Credibility for the 21st Century.
106. Glenton, Nilsen, and Carlsen, Lay Perceptions of Evidence-Based Information.
107. Experience-based credibility here is different from Tseng and Fogg's (1999) notion of "experienced credibility." Experience-based credibility in this context is earned from someone (a source of some information) having gone through a similar experience as the receiver, and thus possessing a firsthand understanding of what the receiver is going through. Experienced credibility is earned by the receiver having firsthand experience with a particular source of information.
108. Donald R. Atkinson, Ponce Francisco, and Francine Martinez, Effects of Ethnic, Sex, and Attitude Similarity on Counselor Credibility, *Journal of Counseling Psychology* 31(1984): 588–90; Donald R. Atkinson, Stephen Brady, and Jesus M. Casas, Sexual Preference Similarity, Attitude Similarity, and Perceived Counselor Credibility and Attractiveness, *Journal of Counseling Psychology* 28 (1981): 504–9; R. Kelly Aune and Toshiyuki Kichuchi, Effects of Language Intensity Similarity on Perceptions of Credibility, Relational Attributions, and Persuasion, *Journal of Language & Social Psychology* 12 (1993): 224–37; Roger L. Worthington and Donald R. Atkinson, Effects of Perceived Etiology Attribution Similarity on Client Ratings of Counselor Credibility, *Journal of Counseling Psychology* 43 (1996): 423–29.
109. Urban Dictionary 2006. Street Cred. <http://www.urbandictionary.com/define.php?term=street+cred>. Archived at: <http://www.webcitation.org/5KT164TW0>.
110. Albert-László Barabasi, *Linked*, 1st ed. (Cambridge, MA: Perseus, 2002).
111. Ibid.
112. S. Shyam Sundar, The MAIN Model: A Heuristic Approach to Understanding Technology Effects on Credibility, this volume.
113. Alison R. Fragale and Chip Heath, Evolving Informational Credentials: The (Mis)attribution of Believable Facts to Credible Sources, *Personality and Social Psychology Bulletin*, 30 (2004): 225–36.
114. Barabasi, *Linked*.
115. Eysenbach, An Ontology of Quality Initiatives.

116. Jennifer A. Goldbeck, Computing and Applying Trust in Web-Based Social Networks (Ph.D. Dissertation, University of Maryland, College Park, 2005), <http://trust.mindswap.org/papers/GolbeckDissertation.pdf>. Archived at: <http://www.webcitation.org/5Lq6IaaFf>.
117. Jennifer A. Goldbeck and James Hendler, Inferring Binary Trust Relationships in Web-Based Social Networks, *ACM Transactions on Internet Technology (TOIT)* (2006), preprint at <http://trust.mindswap.org/papers/toit.pdf>. Archived at: <http://www.webcitation.org/5Lq7fbB1u>.; Eastin, Credibility Assessments of Online Health Information.
118. Commission of the European Communities, eEurope 2002: Quality Criteria for Health Related Web Sites, *Journal of Medical Internet Research* 4 (2002): e15; Helga Rippen, Criteria for Assessing the Quality of Health Information on the Internet, 1998, <http://hitiweb.mitretek.org/docs/policy.pdf>. Archived at: <http://www.webcitation.org/5LojibKCs>.; e-Health Ethics Initiative, e-Health Code of Ethics, *Journal of Medical Internet Research* 2 (2000): e9.
119. Flanagin and Metzger, Digital Media and Youth; Flanagin and Metzger, The Role of Site Features; Metzger et al., Credibility for the 21st Century; Sundar, The MAIN Model.
120. B. J. Fogg, Prominence-Interpretation Theory: Explaining How People Assess Credibility Online, CHI 2003, Ft. Lauderdale, <http://credibility.stanford.edu/pdf/PITtheory.pdf>. Archived at: <http://www.webcitation.org/5I4KpdQO6>.
121. Arlene Goldbard, Generation D: Global Kids' Digital Media Essay Contest, 2006, <http://www.globalkids.org/olp/dmec/DMECREport.pdf>. Archived at: <http://www.webcitation.org/5Lt3AcpTM>, p. 13.
122. Lenhart, Rainie, and Lewis, Teenage Life Online.
123. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?; B. J. Fogg, Jonathan Marshall, Othman Laraki, Alex Osipovich, Chris Varma, Nicholas Fang, Jyoti Paul, Akshay Rangnekar, John Shon, Preeti Swani, and Marissa Treinen, What Makes Web Sites Credible? A Report on a Large Quantitative Study, in *Proceedings of SIGCHI'01*, March 31–April 4, 2001, Seattle, WA.
124. Gray et al., The Internet.
125. Fogg et al., How Do Users Evaluate the Credibility of Web Sites? A Study with Over 2,500 Participants.
126. Flanagin and Metzger, The Role of Site Features.
127. Meola, Chucking the Checklist.
128. Sundar and Nass, Conceptualizing Sources in Online News.
129. Gunther Eysenbach, John Powell, Oliver Kuss, and Eun-Ryoung Sa, Empirical Studies Assessing the Quality of Health Information for Consumers on the World Wide Web: A Systematic Review, *JAMA: The Journal of the American Medical Association* 287 (2002): 2691–700.
130. Fogg, Prominence-Interpretation Theory.
131. Glenton et al., Lay Perceptions of Evidence-Based Information.
132. Michael Smithson, Conflict Aversion: Preference for Ambiguity vs Conflict in Sources and Evidence, *Organizational Behavior and Human Decision Processes* 79 (1999): 179–98.
133. Fogg and Tseng, The Elements of Computer Credibility.
134. Eysenbach et al., Empirical Studies Assessing the Quality of Health Information.
135. Robert S. Taylor, *Value-Added Processes in Information Systems* (Norwood, NJ: Ablex, 1986).

136. Eysenbach et al., Empirical Studies Assessing the Quality of Health Information.
137. Mohan J. Dutta-Bergman, The Impact of Completeness and Web Use Motivation on the Credibility of e-Health Information, *Journal of Communication* 54 (2004): 253–69.
138. Eysenbach et al., Empirical Studies Assessing the Quality of Health Information.
139. Mitchell D. Wong, Steven M. Asch, Ronald M. Andersen, Ron D. Hays, and Martin F. Shapiro, Racial and Ethnic Differences in Patients' Preferences for Initial Care by Specialists, *American Journal of Medicine* 116 (2004): 613–20.
140. Eysenbach and Köhler, How Do Consumers Search for and Appraise Health Information on the World-Wide-Web?
141. Angela Coulter, Vikki Entwistle, and David Gilbert, Sharing Decisions with Patients: Is the Information Good Enough? *British Medical Journal* 318 (1999): 318–22.
142. Elmer V. Bernstam, Dawn M. Shelton, Muhammad Walji, and Funda Meric-Bernstam, Instruments to Assess the Quality of Health Information on the World Wide Web: What Can Our Patients Actually Use? *International Journal of Medical Informatics* 74 (2005): 13–19.
143. Deborah Charnock, Sasha Shepperd, Gill Needham, and Robert Gann, DISCERN: An Instrument for Judging the Quality of Written Consumer Health Information on Treatment Choices, *Journal of Epidemiological Community Health* 53 (1999): 105–11.
144. Sasha Shepperd, Deborah Charnock, and Adrian Cook, A 5-Star System for Rating the Quality of Information Based on DISCERN. *Health Information Library Journal* 19 (2002): 201–5.
145. The DISCERN questionnaire (<http://www.discern.org.uk/>) prompts users to rate health-related Web sites by answering focused questions pertaining to the quality of information found on the site(s) they view.
146. Deborah Charnock and Sasha Shepperd, Learning to DISCERN Online: Applying an Appraisal Tool to Health Web Sites in a Workshop Setting, *Health Education Research* 19 (2004): 440–46.
147. Meola, Chucking the Checklist.
148. Gunther Eysenbach and Maria Thomson, The FA4CT Algorithm: A New Model and Tool for Consumers to Assess and Filter Health Information on the Internet, *Medinfo* (in press).
149. Gunther Eysenbach, Infodemiology: The Epidemiology of (Mis)information, *American Journal of Medicine* 113 (2002): 763–65.
150. Eysenbach and Thomson, The FA4CT Algorithm.
151. Matthew Kreuter, David Farrell, Laura Olevitch, and Laura Brennan, *Tailoring Health Messages. Customizing Communication with Computer Technology* (London: LEA, 2000); Matthew W. Kreuter, Fiona C. Bull, Eddie M. Clark, and Debra L. Oswald, Understanding How People Process Health Information: A Comparison of Tailored and Nontailored Weight-Loss Materials, *Health Psychology* 18 (1999): 487–94; Victor Strecher and Melissa McPheeters, The Potential Role of Tailored Messaging, *Behavioral Healthcare* 26 (2006): 24–26.

Eysenbach G (2008b) Credibility of health information and digital media: new perspectives and implications for youth. In: Metzger MJ, Flanagin AJ (eds) Digital media, youth, and credibility. The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning, The MIT Press, Cambridge, pp 123-154. Google Scholar. Fernandez-Luque L, Karlsen R, Bonander J (2011) Review of extracting information from the social web for health personalization. *J Med Internet Res* 13:e15. doi: 10.2196/jmir.1432. Article Google Scholar. Frost JH, Massagli MP, Wicks P, Heywood J (2008) How the social Do you understand digital media enough to make good decisions? A survey of nearly 6,000 respondents offers insight into how people view the ways personal data is collected, shared and used. Although there are limitations to self-reported perspectives from surveys, this research helps gauge digital media literacy levels and develop perspectives on pressing issues. Citizens that understand the implications of their digital media engagement can make more considered decisions about their economic, social, and political lives. By taking steps to promote an informed society, industry, government and civil society could work together to improve trust in institutions and businesses. To download a copy, please click on the link below. Download the report (PDF-1MB). Youth are particularly youth in marginalized or subordinated social groups are frequently constructed as a "social problem" or "at risk". This then serves to legitimate various forms of treatment the work of social, educational and clinical agencies that seek to discipline or rehabilitate troublesome youth, or to define and correct their apparent deficiencies. Nevertheless, sociologists generally understand these phenomena in terms of social factors such as poverty and inequality rather than as a matter of "raging hormones": their interest is not so much in internal personality conflicts, an Moreover, digital media consumption in the form of increased frequency of ecological website visits, news blogs visits, and web-browsing on broad science, significantly reduce youths' interests in the biosphere. A similar reduction in youths' interest in science-based disease prevention is observed, from news blogs visits and web-browsing on broad science. Conversely, ecological website visits appear to raise youths' interests in science-based disease prevention. Furthermore, we find a gender-based gradient in youths' planetary health interest, in favor of the female gender. Overall, our findi