

Numbers Get In the Way

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Increasingly over the past decade, health literacy researchers and practitioners have been turning their attention to issues of numeracy, recognizing that numeric tasks related to a wide array of health activities have not been sufficiently examined or addressed. Numbers are a vital part of health discussions and play a key role in health decisions and actions. People must grapple with numbers on food and medicine labels, insurance forms, enrollment documents, weather charts, and allergy alerts. They are expected to understand a test result or vital-sign measure in the context of a normal range. They are challenged to undertake risk-benefit analyses for critical decisions. Numbers are important for health action and for health decisions but frequently get in the way for many adults and confound rather than provide assistance.

Interest in health numeracy has been spurred by the various waves of literacy and numeracy surveys examining the skills of adults in industrialized nations. The most recent assessment, conducted by the Organisation for Economic Co-operation and Development (OECD), was the PIAAC Survey of Adult Skills in 2011 (OECD, 2013). Findings indicated that a small percentage of U.S. adults placed in the highest levels of numeracy skills and almost one-third of U.S. adults scored in the bottom two levels. People whose skills are at the lower levels can use whole numbers but may struggle with calculations using percentages and with abstract numerical concepts, such as risk. Analyses of findings indicate that a significant proportion of the U.S. adult population do not have sufficient numeracy skills to meet many of the demands and expectations of modern life.

Numeracy is emerging as an independent variable predicting a variety of health-related outcomes such as disease management, perceived risk, use of tools, and decision making (Ancker and Kaufman, 2007; Nelson et al., 2008; Peters et al., 2014). However, I contend that it would be a mistake for health literacy researchers and practitioners to examine health numeracy issues with a sole focus on the skills or deficits of the public. Literacy is always an interaction: a rich interplay of people's skills and the demands of texts, of patients' listening skills and providers' communication skills, and of individuals' desire to engage and the features of health systems that support or inhibit engagement.

When health literacy is conceptualized only as an attribute or ability of an individual, both research and practice will be stymied by the unknown contribution of the missing variables. As health literacy research expands with a focus on numeracy, researchers must base such work on an understanding of the complexity of texts and numeric displays, assessments of the numeracy skills of those providing information, an understanding of the complexity of health activities, and careful analyses of the context within which action and decision are taking place.

Ancker and Kaufman (2007) provide a schema for a broad examination of numeracy issues for health and health care activities. Their analysis moves beyond a consideration of individuals' skills alone to focus on the interaction between health professionals and the lay public as well as on the mediating effect of "artifacts"—the design and content of health materials, health forms, and health information displays. This schema offers a valuable model for the construction of



research variables and provides an important template for practice considerations. It is used here to shape this discussion.

NUMERACY IN HEALTH INTERACTIONS

The current literature in health numeracy indicates that both the lay public and health professionals experience numeracy limitations. Surveys of the general population and of those with advanced education reveal that we all need help doing math (OECD, 2012; Lipkus et al., 2001). Johnson and colleagues (2014) looked at numeracy among health professional trainees and questioned whether physicians are being prepared for evidence-based medicine. Furthermore, earlier studies such as those by Peters and colleagues (2006, 2007), Gigerenzer and colleagues (2008), Ciampa and colleagues (2010), and Anderson and colleagues (2011) found that numeracy skills of both patients and providers are associated with health outcomes. Consequently, we need to recognize that activities in clinical encounters that involve hearing, reading, or discussion of numbers may be fraught with difficulties, misconceptions, or errors.

Obviously, training in numeracy communication and in the benefits and problems related to various mathematical displays may assist all who communicate health-related numbers and numerical concepts. At the same time, researchers are providing guidance for action. For example, public health and health care professionals are being encouraged to do the math for the reader or patient (Apter et al., 2008), to provide numbers along with words (Peters et al., 2006), to consistently use the same denominators in fractions (Ancker, 2014), and to provide explanations of range parameters and outliers (Zigmond-Fisher, 2014).

NUMERACY AND ARTIFACTS—HEALTH MATERIALS AND TOOLS

The health literacy literature accumulating over the past three decades indicates that, overall, health materials and tools are out of sync with the documented skills of U.S.

adults. This mismatch calls for renewed attention to the written materials, displays, and tools developed for health and health care use. Health materials, including instructions, directions, explanations, charts, graphs, and laboratory results, must be accessible, and the design and development processes must be subject to the same rigor afforded to devices, medicines, and interventions. First and foremost, health professionals must insist on rigorous formative evaluation for the development of all health materials and tools developed for public use.

Research under way is providing insight. We know, for example, that information in graphic format—in charts and through pictograms and diagrams—can be particularly helpful when done well. Promising results have been found for certain icon arrays, bar charts, and risk scales for risk communication (Ancker et al., 2006). Zigmond-Fisher (2014) suggests that the “know your numbers” campaign will be meaningful only if the parameters are clearly explained so that action is feasible. For example, the numbers that relay information about blood sugar or blood pressure are meaningful only if given in the context of a range with endpoints and clear indications of which numbers indicate a need for what kind of action. Furthermore, tools can help people simplify daily routines. For example, Wolf and colleagues (2011) point out that medication schedules and simple charts help patients integrate information for multiple treatments and make plans for daily activity. Tools can also be customized; for example, a simple tape marker on a peak flow meter used by a person with asthma can offer a signal for immediate action.

Additional insight for analyses of artifacts can be drawn from the education field. Educators designing the adult literacy surveys first conducted in 1992 calibrated all the materials and tasks for levels of complexity and difficulty. Irwin Kirsch, one of the architects of the national and international adult literacy surveys, explained the rankings in an insightful monograph (Kirsch, 2001). Text analyses included attention to the type of

continuous text (such as narrative, descriptive, instructive), the format of noncontinuous texts (such as lists, graphs, and locative or entry documents), as well as attention to the presence of distracting information. Kirsch was also involved in the development of the PMOSE-IKIRSCH—a tool underused in health analyses—which offers a measure for the readability of lists, charts, and graphs (Mosenthal and Kirsch, 1998). This assessment tool can help rate as well as construct numeric displays.

In addition, the task analyses undertaken for the adult literacy surveys considered what people had to do with the text and rated levels of difficulty. These tasks include the following: locate information, match information, compare or contrast details, and read “between the lines” to interpret or link information to generate ideas. These analyses of texts and of tasks offer more in-depth examinations of materials than is currently undertaken by many health researchers.

An understanding of text complexity and a deconstruction of tasks people are expected to undertake should be part of future health literacy and numeracy analyses. Researchers first need to more carefully examine the materials themselves and then analyze the proximal tasks people are expected to undertake. These proximal tasks consist of activities and calculations people need to engage in so they can use the materials (such as examine risk categories to determine where one fits or calculate yearly income to determine eligibility). Furthermore, because the health field is concerned with health-promoting action, the more distal tasks require additional focus. Distal tasks are those activities people are expected to engage in after using the materials or tools provided (such as choose the most suitable/affordable health plan; buy the soup with less salt; take the medicine as prescribed). Thus, two key questions that must be asked about the provided “artifact” are as follows: *Is it easy to use?* and *Does it help the individual carry through with the needed task?*

CONCLUSION

Insights from education and health literacy studies can lessen the effects of well-documented numeracy deficits to help everyone more skillfully access and use information for mundane and critical decisions. Many suggested strategies focus on doing the math or providing imbedded calculators; encourage providing numbers along with words; insist on giving meaning to numbers; and offer insights for clear displays. All emphasize the importance of eliminating unnecessary barriers to comprehension, use, and decision making. Supporting ongoing research and sharing evidence-based strategies can help transform data into meaningful information. Doing so supports respectful interactions and promotes the use of information for carrying out mundane health tasks as well as for making health related decisions in the home, in health care settings, at work, in the community, and in the voting booth.

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