

## Maternal schooling and comprehension of child health information in urban Zambia: is literacy a missing link in the maternal schooling-child health relationship?\*



Kathleen W. Stuebing

*Theological College of Central Africa, PO Box 250100, Ndola, Zambia*

### Abstract

This paper examines the relationship between literacy skills and comprehension of health information by studying mothers of young children in a high-density urban area in Zambia. Both decontextualized language and print literacy skills were assessed for each woman and the resulting scores were related to her comprehension of both broadcast and printed health information. The results indicate that fluency in a language is not sufficient for full comprehension of broadcast messages in the decontextualized type of language used in bureaucratic communication, and that a woman's ability to use decontextualized language is associated with greater comprehension of such messages. Skill in using this type of language increases with years of schooling, even in the poorly equipped schools in Zambia, as does print literacy, even though the levels of comprehension achieved are well below their grade level on average for these women. Some implications of these findings for both health care providers and educators are then considered.

This article reports the findings from a study of the language and literacy skills of schooled mothers in Chifubu, an urban township of Ndola, the second largest city in Zambia. World surveys show maternal schooling to be uniquely important in the reduction of child mortality and increase in child health, with the relationship being evident under widely varying levels of school quality (Caldwell 1989; Cleland and van Ginneken 1989; Bicego and Boerma 1991; Hobcraft 1993). This association was also found in Zambia, although more weakly (Zambia Demographic and Health Survey 1992), among mothers schooled in low-quality schools in an educational system under severe economic stress (Kelly 1991). The specific ways in which schooling has this effect are not yet fully understood, however, especially in schools with overcrowded classrooms and lacking books and printed teaching materials.

The presence of this effect in places where the school-based acquisition of a substantial body of health information is unlikely has led to the assumption that something beyond knowledge must be involved. Hobcraft (1993) has summarized various studies among unschooled as well as schooled

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women seeking pathways by which maternal schooling may be linked with reduced child mortality as follows: a socialization effect resulting in greater cleanliness among schooled women (Lindenbaum 1990); greater use of health services by women with more schooling, possibly due to their empowerment through education (Cleland 1990); and a greater emphasis on child quality by more highly schooled mothers (LeVine et al. 1991). Conflicting findings,

however, led Hobcraft to suggest that different pathways may be involved in different cultural settings.

Another hypothesis is that a woman's acquisition of literacy skills in school enables her to make better use of health information and health services in caring for her children. However, literacy is not directly measured in demographic and health surveys, including the ZDHS, and it is rarely measured generally (Mosley 1984; Freund 1987; Hammad and Mulholland 1992). Even the literacy measures that are reported are often problematic in that they are based on women's self-report of literacy, with the attendant possibilities for reporting error; or they treat literacy as a simple ability, either present or absent, which can be easily estimated (LeVine n.d.). As a result, quantitative data on adult literacy in developing countries is scarce, and the effect of maternal literacy on child health is still largely untested.

This report presents a possible channel for the influence of schooling by describing a theory of literacy that has been used successfully in studies of language and reading abilities of US school children, demonstrating the usefulness of this theory in directly assessing two types of literacy skills of the schooled women in this study, and analysing the effects of these skills in the women's comprehension of written and broadcast health messages. These results suggest that helpful literacy skills can be acquired even in schools severely lacking in books and printed materials and that these skills form an important pathway between maternal schooling and maternal comprehension of health messages among schooled, urban women in developing countries. They do not, however, address pathways that may be related to differences between unschooled and schooled women or between rural and urban women.

### **A theory of literacy**

Differing perspectives on what constitutes literacy have complicated the development of valid measures of the abilities involved. In recognition of the varied cultural and social settings in which people interact with print around the world, some have advocated culture-specific descriptions of literate practice as a reflection of what is called functional literacy, noting that such culturally embedded literacy is often acquired outside schools. While such descriptions are useful within cultural groups, literacy measures designed for cross-cultural analysis are needed in educational research, especially research related to understanding how people acquire literacy (Wagner 1991, 1992).

Comparative measures, valid in varied settings, require an assessment of internal cognitive processes based on a psycholinguistic-cognitive approach, including measurements of word recognition and comprehension (Snow and Dickinson 1991). Literacy researchers agree that these internal processes involve major changes in an individual's forms of perception and communication, and they are often associated with the need to interact and carry on business dealings in a wider, more heterogeneous context (Akinaso 1991; LeVine n.d.). Akinaso, in his thoughtful analysis of the emergence of literacy in his rural village in Nigeria, demonstrates how those becoming literate needed to redefine their community by expanding it beyond their immediate 'spatio-temporal horizon', thus confirming the view of literacy experts, despite their disagreements about cognitive consequences, that 'literacy alters the world we live in and the way we perceive and talk about that world' (Akinaso 1991:74-75). Akinaso noted that his non-literate father's world also changed with the need to market cash crops, prompting his father to devise a very accurate method to keep his accounts using various sized pebbles. His father's awareness that one could store and retrieve knowledge from books and papers, however, resulted in the father valuing literacy for his son and supporting his son's further education.

The choice to live in heterogeneous modern African cities also alters people's lives and perceptions of their world in dramatic ways, increasing their need to be able to communicate with and understand people outside their own group or immediate context. In such public,

bureaucratic settings both spoken language and written texts need to be understandable without reference to one's group or neighbourhood and thus require specific linguistic and cognitive skills for their production and comprehension. Such language, labelled 'decontextualized language' in many studies, assumes only the broad social and cultural background knowledge of the wider urban and national context rather than the specific knowledge and understanding of one local neighbourhood or context. This study employs a decontextualized model of literacy in assessing schooled urban Zambian women's ability to comprehend both spoken and written public health messages.

### ***Decontextualized language***

Theorists and researchers are actively exploring the concept of decontextualized language (Scollon and Scollon 1981; Snow 1983; Heath 1983; Torrance and Olson 1985; Tannen 1985; Snow and Dickinson 1991; LeVine et al. 1991; LeVine n.d.), meaning language directed to a context detached from the speaker or author and intended to meet the informational needs of a hypothetical, absent listener or audience as is the case with media broadcasts, books, and newspapers. In decontextualized language, meaning must reside in the words alone rather than in shared contextual understandings, vocal cues such as inflection, or non-verbal gestures in order for the message to be understood by the intended wider audience. It can thus be contrasted with face-to-face conversation where the listener shares the same immediate context and local knowledge as the speaker. For example, in conversation a person may say to her friend 'He left yesterday', and her friend will know what she means while a passing stranger will not have the necessary contextual or background knowledge to understand the message. In order to give a clear message to a distant audience, the person would need to say 'My brother left by bus yesterday to visit our aunt in Lusaka'.

Also, decontextualized language focuses on informational content rather than relational or interactional goals owing to its public, monologic nature whereas contextualized language is usually private and involves dialogue between people who know each other. In addition, since decontextualized language lacks the support of feedback from the listener available in conversation, it requires the speaker or author to accurately assess the informational needs of the hypothetical audience and meet these needs by supplying the relevant information through carefully chosen words.

Although differing in these ways, decontextualized and contextualized language are not dichotomous categories but more like endpoints on a continuum since all texts and messages require some shared background knowledge, and all exist in some context (Tannen 1985). Tannen suggests the term 'recontextualized' to emphasize the new context of a hypothetical and absent audience for decontextualized language. Also, even private conversations give some new information but their interpretive context differs from decontextualized speech or text. Conversations and letters are interpreted privately, locally, and interpersonally while media announcements and printed publications are directed to a large, public audience in an impersonal way.

Certain features are characteristic of decontextualized language in order to make it understandable to absent audiences. The vocabulary used is explicit and specific so that words alone can clearly communicate the meaning and intention of the author. Also, the grammar of decontextualized language is more complex, connecting a piece of information with both what preceded it and what follows it. Conversational speech, on the other hand, is often simple and fragmentary, partly because the speaker lacks the time to compose and edit complex sentences, and also because intonation and contextual cues carry some of the speaker's meaning. In addition, the discourse structure of decontextualized language is monologic with the important relationships being between sentences rather than between speakers as in conversational dialogue. The logical relationships between sentences are expressed in words

and phrases such as ‘because’, ‘therefore’, ‘rather than’, or ‘in contrast’ (Scollon and Scollon 1981). Decontextualized language is primarily associated with written text, but it is also found in the oral presentation of previously written and edited texts, as in radio and television broadcasts and in lectures.

### ***Comprehension and production of decontextualized language***

Although decontextualized language is the means of communication to large audiences, members of such audiences do not have equal ability to comprehend or produce it. In the case of written texts, word recognition or decoding must precede comprehension of the meaning of the text, but people can acquire these skills at differing rates since the skills are developed by different processes. Differing paces of learning these skills are especially evident in those learning to read in a second language, where their ability to comprehend the meaning of a text is often greater than would be expected from their decoding abilities (Snow and Dickinson 1991).

In the oral mode also, some aspects of oral expression are more clearly related to the acquisition of literate or decontextualized language skills than are others. Torrance and Olson (1985) found that children in the early years of school whose speech included cognitive verbs such as ‘know’, ‘think’, ‘believe’, or ‘doubt’ were both better conversationalists and better readers. They therefore concluded that metalinguistic awareness or the ability to think about language as well as the need to use language to communicate the intended message is a prerequisite for developing literacy skills, and this is confirmed by Akinnaso (1991) in his own literacy development. The awareness that words have specific meanings, with some words representing what was intended better than others, undergirds both oral and written decontextualized language skills.

Whether in oral or written form, therefore, the production and comprehension of decontextualized language rests on specific cognitive and linguistic skills. Snow (1983, 1990) suggests that these include the ability to anticipate the information needed by an absent audience and analyse one’s own knowledge in relation to those needs. The ability to reflect on language and especially on word meanings then helps one to choose words and phrases that accurately convey that information. In addition, skilled listeners or readers are also able to analyse and revise their own knowledge on the basis of new information they receive through decontextualized text or utterances.

### ***Acquiring decontextualized language skills***

Children have their first experiences of language learning at home, and children from different social and cultural groups have quite different early language experiences. In school-dominated societies, middle-class parents often train their pre-school children in the use of decontextualized language structures, sometimes unconsciously and at times as a deliberate preparation for school (Heath 1983; Wells 1985; Snow and Dickinson 1991). But parents from lower social classes in these societies interact with their children in much more contextualized ways, so social class appears to be a factor.

A closer look, however, reveals that differences in expectations and assumptions about the purpose of speech and appropriate adult relationships, both between and within social classes, are the primary factors rather than social class alone. Bernstein (1972) suggests that the relative power or authority of individuals and families in the wider society is reflected in their development of appropriate speech, and people in relatively less powerful positions tend to use more context-embedded speech. Tannen (1985), however, demonstrates differences in conversational language strategies between highly literate middle-class people, with some

focusing on context-dependent interpersonal involvement and others on the more context-independent content or information conveyed.

Although speech in traditional cultures is generally embedded in the immediate context, differences in language use between and within various cultures also appear. These differences reflect social position as well as personal intention. Therefore, the right to speak is often status-related, especially in more hierarchically organized societies, and cross-cultural studies demonstrate that even a mother's talk to her infant or young child reflects the social status and communicative patterns considered appropriate in that society (Schieffelin and Ochs 1986; Richman, Miller and LeVine 1992). In Africa, for example, the Basotho people of Lesotho, who are not highly stratified socially, say 'a quiet person will perish', and they consider it the responsibility of everyone to teach young children to talk. The hierarchically organized Gusii of Kenya, on the other hand, seek to raise quiet, compliant babies and young children by refraining from teaching children to talk and by emphasizing silence as a mark of respect (Demuth 1986; LeVine, Dixon et al. 1994). Within Zambia, also, early ethnographers reported that the more egalitarian Tonga people talked to babies while the hierarchically organized Bemba people generally did not (Richards 1939; Colson 1958).

Talk directed to children in traditional societies reflects the contextual embeddedness of normal communication, however, and traditional parents view as peculiar the types of question-answer and description conversations used by Western middle-class parents to train their children in school-type decontextualized speech (Scollon and Scollon 1981; LeVine, Dixon et al. 1994). Children in these societies thus arrive at school with far less home verbal preparation for learning decontextualized literacy skills than their Western middle-class counterparts, and in some groups the requirement for showing hierarchical respect through silence further increases the gap between home and school. Nevertheless, the amount of speech directed to babies and young children by their mothers rises and the speech exhibits a more pedagogical intent with the amount of the mother's schooling (Richman et al. 1992; Stuebing 1994; LeVine, LeVine et al. 1994).

The school is the institution with primary responsibility for training children in literacy skills including decontextualized language abilities. LeVine and his colleagues point out that school is often a child's first direct exposure to the bureaucratic institutions that are typical of the modern, urban setting; centres providing modern medical services are another example of such institutions (LeVine, LeVine et al. 1994; LeVine n.d.). For traditional children, entry into school entails a move from their familiar context into a different context where they interact with an adult in new, non-traditional ways. The pattern for adult-child interaction in traditional agrarian societies is that of apprenticeship, where the child learns through observation and graded participation in the process of production. The pattern of learning in school is different in several important respects, especially in the school's emphasis on teacher-pupil attention and verbal communication. Teachers talk to young children with the intent of teaching them through words, while in the apprenticeship system the child observes and practises with relatively little attention and even less verbal communication from the master.

Once children are in this new context at school, they are required to imagine yet another context: that of the hypothetical listener before whom they are expected to manipulate and display their new knowledge through the medium of words alone, sometimes when the knowledge is already possessed by the immediate listeners (Wells 1985). This is indeed a strange and bewildering task for traditional children since displays of knowledge are usually discouraged at home, but they come to recognize it as appropriate for school and most achieve at least moderate school success (Scollon and Scollon 1981; LeVine, Dixon et al. 1994).

Teachers use books and, even where books are absent, explicit and decontextualized speech to pass on new knowledge to children, and they then coach the children in the

production of complete, explicit decontextualized answers to the teacher's questions. It is possible that in poorly equipped schools children may learn to focus more carefully on orally presented knowledge because of the lack of printed material: for example, a Grade 7 teacher in Ndola reported having 13 books for her class of 59 pupils in a reading subject. Also, the children are expected to acquire knowledge from an expert, either the teacher or the author of a book, rather than from personal experience. Thus even children in schools of low quality have experience in analysing and revising their own knowledge in light of new information presented to them both orally and in print.

The effects of these skills on the receiving of health information in the later lives of women is the focus of this paper. This health information, which is designed for mass consumption, is given in the explicit, decontextualized language that women encountered in school and presents new knowledge to be assimilated. The purpose of this study in urban Zambia was to investigate the relationship between a woman's schooling, literacy and decontextualized language skills, and her comprehension of broadcast and written health messages as a possible channel for schooling's positive relationship with child health.

## **Design of the study**

### *Setting*

Ndola, Zambia's second largest city with a population of about 290,000 in 1990, is the commercial centre of the Copperbelt Province, the area bordering Congo, Kinshasa (formerly Zaire) where Zambia's copper-mining towns are located. Chifubu, the site chosen for this study, is a high-density township of about 55,000 people where self-employed, skilled, and unskilled workers representing Zambia's wide lower-middle and working classes live in small, closely spaced houses built in the 1950s by the British colonial government on standard one or two-bedroomed floor plans. The houses have electricity, piped city water, and a flush toilet, but these are often in a poor state of repair due to the current economic crisis in the country and the great stress placed on the aging city services by rapid urbanization and population growth. Civic authorities in Chifubu identified domestic crowding as their most important problem.

Chifubu is representative of urban situations throughout Zambia, where people from all parts of the country come for jobs, schooling for their children, health care and greater availability of social services than is found in rural areas. About 70 per cent of the fathers in this study are employed workers ranging from labourers on a brewery assembly line to clerical and office employees, while 15 per cent are self-employed in jobs such as small-scale tailoring, street vending or running their own retail shops or transport companies. At the extremes of the occupation continuum for Chifubu are the five per cent who are unemployed and the seven per cent who are in professional or management positions. The range of years of schooling of these mothers in Chifubu, from 0 to 12 years, is generally representative of urban Copperbelt Zambian women born since independence in 1964 when schooling was made widely available.

The similarities between these findings and those of the Zambia Demographic and Health Survey (ZDHS) of 1992 support this assumption of generalizability. Analysis of the 1638 Copperbelt women aged 15 to 49 years in the ZDHS revealed that their mean grade achieved was 6.4 with 8.5 per cent being from rural Copperbelt areas. The mean grade achieved for the fathers in the ZDHS was 8.8 (Pai 1996). The 157 women aged 17 to 30 in the current study are all living in an urban area and do not include older women. One result of this selectivity is that there is only one unschooled woman in this sample, whereas 6.6 per cent of the Copperbelt women in the ZDHS were unschooled. Lack of schooling is more common among

older women and those living in rural areas in the ZDHS sample. Even with these sampling differences, however, the mean grade achieved in this sample is 7.7 for the women and 9.6 for the men, reasonably similar to the means of the ZDHS and supportive of the assumption of generalizability of this level of schooling to urban Copperbelt areas.

Zambia encompasses about 70 tribes and language groups with mothers in this study representing 25 tribes and with 70 per cent of them being in intertribal marriages. English as Zambia's official language is the language used in education and in the urban centres, but each area of Zambia also has a predominant vernacular language. Bemba is that language for Ndola, although Bemba was imported with industrialization and is not the indigenous language of the area.

### ***Study participants***

Although the vast majority of houses in Chifubu are owned and rented out by the city council, Zambia Breweries owns one section of houses which they provide for their employees and an adjacent section consists of privately owned houses. The section of about 4,000 people selected for this study includes some of the privately owned and company-owned houses along with a majority of council-owned houses. A house-to-house census identified 219 mothers aged 30 or under with a child under five years of age at the beginning of the data collection. All women initially agreed to participate in the study, but quite a few women moved away from the area, in some cases because of relational problems, while others missed parts of the data collection owing to their work, extended visits outside the area, or in a few cases death of the baby being studied. As a result, complete literacy data were collected a year and a half later on the 157 women in this study. The sample mothers therefore represent those in more stable relationships and settled situations, but there are no indications that their literacy skills differ significantly from those who moved away. The age limit was chosen in order to include only women whose school-going years coincided with the wide availability of schooling after independence.

### ***Research question and language tasks***

This study addresses the question: how is a woman's school-acquired decontextualized language skill and reading comprehension related to her understanding of broadcast and printed health messages? The goal is to understand the cognitive and psycholinguistic aspects of decontextualized language skill as acquired in schools lacking books where print literacy is inadequately imparted or retained, and to investigate the effects of these skills on a woman's comprehension abilities, both oral and written, as an indication of how her language skills might lead to improved health for her children.

The specific questions to be asked of these data are whether women with stronger decontextualized language skills and reading comprehension are also better able to understand broadcast health messages, and understand printed health messages. If women's scores on the oral decontextualized language task and the reading comprehension assessment are positively associated with their scores on the practical listening and reading tasks, this would suggest support for the presence of the cognitive and psycholinguistic skills in these women, retained from their schooling, associated with decontextualized speech and reading comprehension in earlier studies on school children (Torrance and Olson 1985; Snow 1990; Snow and Tabors 1993).

On the basis of definitional ability as a measure of decontextualized language skills developed by Snow et al. (1987) and used in cross-cultural settings by LeVine, Dexter et al. (1994), a *noun definition task* has been used to assess women's decontextualized language skill in this study, with each woman choosing either English or Bemba as the language in

which to do the task. The task was designed to measure a woman's ability to give formal definitions of common nouns, definitions that do not assume a shared context with the listener. Each woman was asked to 'tell someone who does not know' what each of ten common nouns such as 'pot', 'thief', and 'bed' mean. All items, including their constituent parts, were things well known to these women. Since she was specifically instructed to direct her answer to a hypothetical person lacking this knowledge, each woman's answer is seen as an indication of her ability to ignore her present context, evaluate the information needed by the hypothetical listener, and manipulate her own knowledge to meet that need. Since the hypothetical listener is not present, a woman would need to reflect on the meaning of the words she uses to describe the item and carefully choose explicit words to convey the needed information. This task requires a display of knowledge (which the immediate listener already has) typical of school-related questions.

Contextualized definitions in this situation would be those that refer to the speaker's personal experience, such as saying 'A thief stole my blanket', or referring to the shared conversational context, as in pointing to a pot. Decontextualized descriptions, on the other hand, would describe an item like a bed in terms of its general category of membership ('a piece of furniture . . .'), uses ('to sleep on . . .'), and specific features ('having legs, a base, and a mattress or blanket'). Each woman's response for each noun was coded by the same examiner on a scale of 1 to 7 with the final noun definition score being the average of all ten scores.

A *reading comprehension score* was obtained for each woman based on her decoding aloud of a Grade 1 passage and then the percentage of ideas she could repeat back after silently reading health passages from readers for Grades 3, 5 and 7. The relationship between these women's decoding skills and reading comprehension confirmed the findings of Snow and Dickinson (1991) for readers in a second language in that their comprehension abilities were greater than their decoding skill would indicate. Each woman was judged to have passed any level where she could repeat at least 50 per cent of the ideas from the passage at that level.

Each woman's practical language and literacy skills were then assessed by a *listening* and a *reading comprehension task* using general health messages. In the listening comprehension task, each woman was asked to listen to a tape recording of brief health messages in both English and Bemba that had been broadcast on Zambian radio. After each message, she was asked to repeat back the ideas covered, and her total score was the percentage of ideas she was able to repeat. For the reading comprehension task, brief printed health messages in both English and Bemba were presented to each woman, and she was again asked to repeat back the ideas in the message. All women were given the printed messages regardless of their scores on other aspects of the literacy assessment, and 51 women were unable to repeat back any ideas in the printed messages. These and similar messages were commonly seen on posters in clinics.

### **Method of analysis**

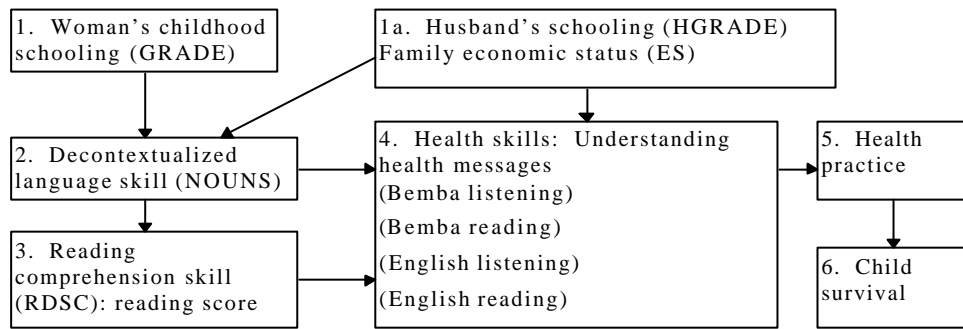
In order to address the questions seeking relationships between a woman's decontextualized language skill and other aspects of her literacy skill and comprehension, simple correlations were estimated between the language and comprehension measures, and simple and multiple regression models were fitted predicting the practical oral and written comprehension of health messages.

Earlier research indicates that some other economic indicators may also be influencing these associations, however. On the basis of his analysis of world surveys, Hobcraft (1993) recommends including husband's grade as a control variable since this has been found to be influential on child health beyond the effect of mother's schooling in urban areas generally,

and especially in sub-Saharan African countries. It has therefore been included in this study in urban Zambia. Hobcraft also recommends controlling for economic level, so both husband's school grade achieved and family economic status were included in the regression models to assess this influence. Possession of consumer goods has been shown to be a reasonable measure of a family's economic status in other cross-cultural settings (Lockheed, Fuller and Nyirongo 1989), so the mother's reports of possession of selected consumer items<sup>1</sup> and of her husband's school grade completed were used as measures of family economic status.

Figure 1 shows the relationships between mother's schooling and child survival and the hypothesized influence of the literacy skills under study here.

**Figure 1**  
**The theoretical model of the relationship between maternal schooling, decontextualized language skills, reading comprehension and comprehension of public discourse, both oral and in print.**



Demographic and health surveys throughout the world have shown a clear and enduring relationship between Boxes 1 and 6, and evidence is increasingly indicating associations between Boxes 1 and 5. Links between Boxes 4 and 5 are also emerging (Preston 1989), but the intervening variables between Boxes 1 and 4 are still not clear, and they are the focus of this study. LeVine and his colleagues have demonstrated effects for literacy skills in this theoretical model for Mexico, Nepal and Zambia in their preliminary report (LeVine, Dexter et al. 1994; LeVine n.d.), and Dexter, LeVine and Velasco (n.d.) have identified decontextualized language skill as a particularly influential literacy skill within a similar model for Mexico.

The model in Figure 1 seeks to identify the specific effects of two aspects of literacy, namely decontextualized language skill and reading comprehension, as links between maternal schooling and a mother's understanding of health messages in urban Zambia. This model suggests that even schools lacking books and teaching materials have a measurable effect on child health by imparting literacy skills, oral and written, that a woman retains into adulthood, and these skills then enhance a woman's comprehension of public health information, thus enabling her to care for her child in healthful ways.

<sup>1</sup>Possession of the following commonly desired consumer goods were measured by assigning a code as follows: 1=does not own, 2=owns each of the following - radio, cassette recorder, bicycle; and 1=does not own, 3=owns each of the following - TV, stove, refrigerator. A woman's family ES (economic status) score consisted of her total on these items with possible scores ranging from 6 (owns none of the items) to 15 (owns all of the items).

These are the links being tested empirically in this study by the following analytical steps: (1) estimated simple correlations (Pearson  $r$ 's) between the variables being studied; and (2) fitted regression models testing the expected relationships. The regression models are designed to test the effects of the following on both English and Bemba listening and reading comprehension of health messages: the effects of schooling (GRADE) alone; the effects of the noun definition score (NOUNS) controlling for schooling and recommended background influences (HGRADE or husband's grade and ES or family economic status); and the effects of the reading comprehension score (RDSC) controlling for noun definition score, schooling and background influences. Therefore, each taxonomy of regression equations is as follows:

$$M1: \text{OUTCOME} = \text{GRADE}$$

$$M2: \text{OUTCOME} = \text{GRADE} + \text{HGRADE} + \text{ES} + \text{NOUNS}$$

$$M3: \text{OUTCOME} = \text{GRADE} + \text{HGRADE} + \text{ES} + \text{NOUNS} + \text{RDSC}$$

These models test the hypothesis that, at any grade level, a woman's adult comprehension of oral and printed health messages is directly related to her literacy skills, and particularly to her decontextualized language skills when her comprehension of printed material is low.

## Results

### Data description

Table 1 shows the averages and the range of variation of these women for each of the variables in the study. It illustrates the background to the research question in this study in that the average school attendance for these women is 7.7 years while their average reading comprehension is below the Grade 3 reading level. This indicates that school quality does have an effect on literacy acquisition and retention in Zambia. Low school quality due to economic stress results in poor acquisition of literacy skills by the children attending school here as has been found in other poor countries (Fuller 1992).

**Table 1**  
Summary statistics describing women's language and literacy skills, their schooling, their husbands' schooling and family ES (n=157)

Variable	Description	Mean (Std. Dev.)	Range
<i>Control variables</i>			
GRADE	Woman's schooling (years)	7.73 (2.13)	0-12
HGRADE	Husband's schooling (years)	9.55 (2.59)	0-12
ES	Family economic status	8.44 (2.17)	6-15
<i>Predictors</i>			
NOUNS	Noun definition score	2.35 (1.06)	0-5.2
RDSC	Reading comprehension score	1.33 (1.47)	0-4
Coding: 0=illiterate, 1=decoding only, 2=Grade 3 comprehension, 3=Grade 5 comprehension, and 4=Grade 7 comprehension			
<i>Outcomes</i>			
BLISTN	Bemba listening comprehension	0.54 (0.13)	0.2-0.8
ELISTN	English listening comprehension	0.18 (0.2)	0-0.8
BPRINT	Bemba print comprehension	0.42 (0.33)	0-1
EPRINT	English print comprehension	0.39 (0.39)	0-1

Decontextualized language ability as reflected by the noun definition score is also very low considering that the highest score possible was 7. Whereas the highest decontextualization score achieved by these women was an average of 5.2, the majority of women averaged between 1.3 and 3.4 indicating that their noun definitions were quite highly contextualized, and only a minority of women were able to give relatively decontextualized definitions.

The complexities of the language situation in Zambia probably add to the effects of low school quality demonstrated in these averages in that literacy is widely assumed to mean English language reading comprehension since English is the language used in education (Kashoki 1990). Also, although the women would all be relatively fluent speakers of what is called 'town Bemba', very few of them would have had school instruction in reading Bemba, especially if they started school in a non-Bemba-speaking area.

The effects of low school quality in addition to the complex language situation can be seen in the relatively low averages for these women on all the comprehension outcome measures. The only measure having an average score of close to 50 per cent comprehension is Bemba listening. Considering that all the women have some degree of fluency in Bemba, this indicates that fluency alone is not sufficient for a high degree of comprehension of orally presented health messages. This gives cause for concern in view of current efforts to spread health information, including information about HIV/AIDS, to illiterate women through radio and spoken instructions.

It is interesting to note that the average for women's listening comprehension in English is much lower than for their English reading comprehension whereas the opposite is true for Bemba comprehension. This is probably due to lack of exposure to spoken English in their daily lives, since women can listen to radio programs in their choice of vernacular languages, and they can interact with health care providers in Bemba. The national newspapers are produced in English only, however, and printed material in vernacular languages is scarce. Some women reported that they read their children's school books in an effort to relieve their boredom with the only reading material available to them. These books are in English, so it would seem likely that these women take more opportunity to practise reading English than to listen to spoken English. Since oral comprehension of a new language develops before print comprehension, the retention of greater print comprehension than oral comprehension of English on average for these women suggests that subsequent opportunities for use have an effect on a woman's retention of her school-acquired literacy skills, especially in a second language.

Table 1 also indicates that the average woman in this sample has a husband with almost two more years of schooling than she has (9.6 years on average for men and 7.7 years for women) and the average home represents relatively low economic status, having only one less costly consumer item: a radio, cassette recorder or a bicycle.

**Correlations between variables**

Table 2 gives the estimated simple correlations between the predictor (or theoretical) and outcome (or practical) variables along with the control variables.

**Table 2**  
**Estimated simple correlations between schooling, control variables, and language skills (n = 157)**

	1	2	3	4	5
Mother's schooling					
Husband's schooling					
Family possessions					
Noun definitions score					
Reading comprehension					

*Control variables*

GRADE	1.0				
HGRADE	0.34***	1.0			
ES	0.27***	0.22**	1.0		
<i>Predictors</i>					
NOUNS	0.50***	0.26***	0.24***	1.0	
RDSC	0.52***	0.23**	0.55***	1.0	
		0.21**			
<i>Outcomes</i>					
Bemba listening	0.20***	-	-	0.37***	0.42***
English listening	0.68***	-	-	0.55***	0.65***
Bemba reading	0.42***	-	-	0.43***	0.63***
English reading	0.65***	-	-	0.49***	0.75***

\*p<.05; \*\*p<.01; \*\*\*p<.001.

Column 1 of Table 2 supports the continuing influence of a woman's schooling during her childbearing years in that both reading comprehension and decontextualized language skill are highly correlated with a mother's schooling. This indicates that even in schools having few books and teaching materials, teachers are able to accomplish at least some of what they intend to do: teach children literacy skills. It also indicates that children retain these skills into adulthood, especially when they have opportunities to use the skills in their daily lives. Although the two linguistic skills of decontextualized language ability and reading comprehension are also highly correlated with each other (0.55,  $p < .001$ ), the uncorrelated portions indicate that they are more than different measures of the same underlying skill. The correlations with noun definitions, the measure of decontextualized language skill, indicate that, on average, women who are better able to give decontextualized definitions also attended school longer, are married to a more educated man, have somewhat more family possessions, and have greater comprehension of oral broadcasts and printed health material in both Bemba and English.

The differences in the correlations of Bemba listening comprehension with mothers' grade and with noun definitions suggest support for the causal link hypothesized in Figure 1 where decontextualized language skill is the first link carrying the influence of schooling on listening comprehension. The fact that decontextualized language skill (NOUNS) is more highly correlated with schooling (0.50,  $p < .001$ ) and with Bemba listening comprehension (0.37,  $p < .001$ ) than these two are with each other (0.20,  $p < .001$ ) demonstrates the influence of this link. This means that, on average, women who were in school for fewer years have lower decontextualized language skills and are less able to comprehend Bemba health broadcasts and instructions even though these women speak Bemba.

These correlations for Bemba listening comprehension also suggest that something beyond school experience is influencing a woman's current decontextualized language skills in her daily language, possibly living and interacting in a heterogeneous, bureaucratic, urban environment. Akinnaso (1991) has described the influence of the need to interact and do business in a more heterogeneous setting on the development of more literate modes of communication for traditionally rural people. The 25 tribal groups represented among the women in this study indicate a heterogeneous community, and the 70 per cent of the women

in intertribal marriages would also need to communicate across ethnic differences in their homes.

The preliminary report by LeVine, Dexter et al. (1994) gives further support for the influence of living in a heterogeneous, urban, bureaucratic setting on a woman's acquisition of decontextualized language skills. That study compared the literacy skills and their correlations with schooling for women in rural Mexico and rural Nepal with those for urban Zambia presented here. Whereas a woman's decontextualized language skill was correlated with her schooling at 0.72 for Mexico and 0.67 for Nepal, the correlation for Zambia was 0.50 (all at .001 level of significance). Since the women in both the Mexican and Nepalese studies lived in homogeneous rural communities, the lower level of correlation found for urban women in a heterogeneous setting in Zambia supports the hypothesis, also suggested by Akinnaso (1991), that decontextualized language skill can be learned as part of a person's efforts to cope successfully in mixed urban communities.

However, in the cases of Bemba print and English speech and print comprehension, the correlations with mother's grade are close to those with the literacy measures. This suggests that community influence on literacy skills is most evident in the comprehension of speech in the dominant language of the community while school-acquired literacy skills are the main influences in a woman's comprehension of print in both languages and of English speech. The correlations with husband's grade and family economic status support the need to also assess their influence on a woman's literacy skills and comprehension in the fitted regression models that follow.

**Regression analysis**

The following regression analyses were used to determine the relative influence of each of the correlated variables in Table 2 on a woman's practical language comprehension abilities. First the amount of comprehension due to schooling alone was assessed by the first model (M1) in each table. Since the correlations clearly indicate that schooling alone does not explain all of a women's comprehension abilities, the next model (M2) assesses the additional amount of comprehension due to decontextualized language skill, controlling for the influence of a woman's current home background as indicated by her husband's schooling and family economic status. Although analysis to this point indicates weak reading comprehension skills on average for these women, print literacy is often assumed to be the primary route by which a woman's earlier schooling influences the health of her children. The third model (M3) indicates the relative influence of even low levels of print literacy, in addition to the variables already tested, on comprehension abilities in both Bemba and English for these women.

These models are each fitted for both listening comprehension in Tables 3 and 4, and reading comprehension in Tables 5 and 6. In each case, the analysis of Bemba comprehension is given before that for English comprehension and n=157 in each of these models.

**Table 3**  
**Taxonomy of regression equations predicting Bemba listening score**

	Intercept	GRADE	HGRADE	ES	NOUNS	RDSC	F	df	R2	R2
M1	0.45*** *(0.04)	0.01** (0.00)					6.2**	1,156		.04
M2	0.46*** (0.05)	0.002 (0.005)	0.001 (0.004)	-0.004 (0.005)	0.04*** (0.01)		6.3***	4,153		.14
M3	0.51*** (0.05)	-0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.03** (0.01)	0.03*** (0.00)	8.2***	5,152		.21

\*P<.05; \*\*P<.01; \*\*\*P<.001.

**Table 4**  
**Taxonomy of regression equations predicting English listening scores**

	Intercept	GRADE	HGRADE	ES	NOUNS	RDSC	F	df	R2
M1	-0.29*** (0.04)	0.06*** (0.00)					132.4***	1,156	.46
M2	-0.36*** (0.05)	0.05*** (0.00)	0.008* (0.00)	-0.00 (0.00)	0.05*** (0.01)		43.3***	4,153	.53
M3	-0.29*** (0.05)	0.04*** (0.04)	0.01* (0.00)	-0.00 (0.00)	0.03* (0.01)	0.04*** (0.01)	46.1***	5,152	.60

\*p<.05; \*\*p<.01; \*\*\*p<.001.

**Table 5**  
**Taxonomy of regression equations predicting Bemba reading scores**

	Intercept	GRADE	HGRADE	ES	NOUNS	RDSC	F	df	R2
M1	-0.08 (0.09)	0.06*** (0.01)					33.3***	1,156	.18
M2	-0.225* (0.12)	0.04** (0.01)	0.01 (0.00)	0.01 (0.01)	0.08*** (0.03)		12.9***	4,153	.25
M3	-0.06 (0.11)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.02 (0.02)	0.11*** (0.02)	21.4***	5,152	.41

\*p<.05; \*\*p<.01; \*\*\*p<.001

**Table 6**  
**Taxonomy of regression equations predicting English reading scores**

	Intercept	GRADE	HGRADE	ES	NOUNS	RDSC	F	df	R2
M1	-0.50*** (0.09)	0.11*** (0.01)					115.2***	1,156	.42
M2	-0.58*** (0.12)	0.09*** (0.01)	0.00 (0.01)	0.00 (0.01)	0.08** (0.02)		33.2***	4,153	.46
M3	-0.35*** (0.10)	0.06*** (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.02)	0.13*** (0.02)	52.9***	5,152	.63

\*p<.05; \*\*p<.01; \*\*\*p<.001

In Table 3, a woman's schooling alone (M1) explains very little (only 4%) of her Bemba listening comprehension, although schooling accounts for 46 per cent of a woman's English listening comprehension in Table 4. With reading comprehension also, only 18 per cent of a

woman's Bemba comprehension is attributable to her schooling in Table 5 while the figure for her English comprehension due to schooling is 42 per cent in Table 6. Even though women do not use English regularly, the effects of their schooling in English are still evident in that, on average, years of schooling alone account for nearly half of a woman's comprehension in English.

### ***Predicting print comprehension***

Since print literacy skill is underlying the predictor variable of reading comprehension score as well as the outcome measure of comprehension of printed health messages, it is to be expected that M3 explains considerably more of a woman's comprehension of printed health messages for both Bemba and English than the models for schooling and noun definitions (M1 and M2, Tables 5 and 6). It is worth noting, however, that oral decontextualized language ability does explain some of the comprehension of printed health messages across grade levels, especially in Bemba, even though print literacy skills are the more influential predictors. This may indicate that decontextualized language skill enhances a woman's acquisition and retention of print literacy as suggested by Snow and her colleagues (Snow et al. 1987; Snow 1990). Family economic status and husband's grade, on the other hand, are not associated with a woman's comprehension of print in any of the models tested.

### ***Predicting listening comprehension***

Since much official health advice to mothers is given orally by both health care providers and media messages, the relationships between schooling, language skills and oral comprehension are especially important in relation to child health. And it is in these relationships that the effects of decontextualized language skills are most evident.

A woman's decontextualized language skill shows a strong relationship with her comprehension of spoken Bemba health messages (Table 3), and neither schooling nor family background adds any influence. Decontextualized language skill continues to have this clear influence when reading comprehension is included in the model. This indicates that, even with the low averages of both decontextualized language skill and reading comprehension for these women, stronger literacy skills and especially stronger decontextualized language ability enable a woman to better comprehend spoken health messages. Women who can more effectively analyse a message and convey its meaning to a stranger through words alone can also more accurately understand the meaning of Bemba messages conveyed to them by words alone. The ability to evaluate words and carefully choose the clearest ones is developed primarily in school, and this happens to some degree even in low-quality schools since much of the teaching is done orally. Also, women who can read with comprehension can more accurately understand both spoken and written Bemba messages.

This supports the theoretical model, suggesting that school-acquired decontextualized language skill (Box 2 in Figure 1), a linguistic-cognitive ability developed even in poorly equipped schools that rely heavily on oral instruction, links a mother's schooling (Box 1) to the health of her child (Box 6) by increasing her comprehension of oral health messages (Box 4). This influence of decontextualized language skill operates in addition to the influence of reading comprehension (Box 3). LeVine's (n.d.) comparative analysis of these data with similar data from Mexico and Nepal supports maternal literacy as critical to the spread of health information as has also been suggested by Preston (1989).

The assumption that mothers who gain more health care knowledge through these literacy skills will also act on their new knowledge (Box 5) has not been tested for this group of mothers, however. Ease of access to medical services has been associated with reductions in infant mortality in Indonesia (Frankenberg 1995), and the Zambia Demographic and Health

Survey (1992) found that the easy access to free medical services available in the Copperbelt resulted in almost all women, regardless of school attainment, using these services to some degree. For example, 98 per cent had used modern medical prenatal care during their last pregnancy, defined by the ZDHS as antenatal care from a nurse or midwife on four or more occasions and at least one tetanus vaccination; and 85 per cent had medically assisted hospital delivery for their last child (Pai 1996). In this sample, all reported having antenatal care by a doctor or nurse-midwife from the seventh month of pregnancy, with 88 per cent starting this care earlier in their pregnancies. Also, 90 per cent of the women in this sample gave birth at the hospital or clinic.

The people in this study are intensely urbanized and bureaucratized in that they are almost all second-generation urban dwellers. They live in government or employer-owned housing, have very low-cost education for almost all the children in their community, and benefit from easily accessible free medical services, police protection and a functioning court system. Thus it appears that urbanization and ease of access to services make use of modern health services virtually universal as the figures above demonstrate, thus overriding the schooling effect in a woman's use of public health services for this population. But ethnographic observations, not yet fully analysed, suggest differences in home health care for children that co-vary with mother's schooling for these women. Also, a woman's ability to follow at home instructions given by the medical services may vary with maternal literacy in light of the comprehension differences documented in this study.

When the influences on a woman's comprehension of spoken English health messages are considered (Table 4), decontextualized language skill is again an important predictor of this ability. In the case of spoken English comprehension, however, schooling plays a major part as does skill at reading comprehension. Husband's grade level also has an influence, although there is no influence attributable to family economic status. But decontextualized language skill adds to a woman's oral comprehension ability in English beyond the influence of her schooling, her husband's schooling, and her ability to read with comprehension.

As women acquire greater ability to use the decontextualized language that is understandable in a variety of contexts, they also acquire greater ability to understand health messages that originate outside their own context and are conveyed to them in English. This relationship is found across all levels of schooling, husband's schooling and reading comprehension for these women. The additional influence of the husband's schooling on a woman's understanding of spoken English may indicate that English is spoken and/or listened to on radio or TV more frequently in homes where both parents have higher levels of schooling. But whatever the current home situations for these women, these findings suggest that minimal literacy skills acquired as children in poorly equipped schools are now helping them assimilate and presumably act upon health care information for the good of their children. The consistent effects of a woman's decontextualized language skill on her listening comprehension support the theory that this skill indicates an ability to assimilate and arrange orally presented knowledge using words only, a linguistic-cognitive ability that enables a woman to more effectively use new knowledge in a mixed, urban, bureaucratic society.

## **Discussion and conclusions**

The results of this study support the theory that school-acquired literacy skills, and especially oral decontextualized language skill, are indeed a missing link in the relationship between maternal schooling and child health generally, and between maternal schooling and adult comprehension of health information, specifically in urban Zambia. The worldwide association between maternal schooling and child health was found by the Zambia Demographic and Health Survey (1992) to be weaker in Zambia than elsewhere, however. The ZDHS reported the striking finding that infant and child mortality had risen 15 per cent in

the previous decade in Zambia, and they suggest the deteriorating economy, undernutrition, and AIDS as possible reasons for this worrying trend.

With several difficult to treat or fatal diseases such as drug-resistant malaria, hepatitis B and AIDS on the increase among children in Zambia, even mothers' education and careful health behaviour cannot reverse the increasing mortality rate once children are infected. In response to this, medical services are focusing especially on efforts to educate people on prevention measures for these and other diseases. This education is given through spoken and printed messages and therefore comprehension of these messages by the intended audiences is vital if people are to be equipped to act on the information being given to them in preventing illness in their children.

In view of the potential for economic factors to negatively affect child health more generally, it is encouraging to find that oral decontextualized language ability may be especially influential in settings where school quality is low. In countries such as Zambia, where economic problems have severely reduced the availability of school materials, much instruction is given orally with the result that children need to take in and process new knowledge through listening. Urban Zambian women who attended school longer developed greater ability to comprehend health information given orally in both their daily language and in the school language of English. These women also retained a higher level of reading comprehension from their school instruction even though the levels were well below their grade level at leaving school, and this ability aided their comprehension of both spoken and printed health messages.

Since schools as well as clinics and hospitals are bureaucratic institutions that rely on explicit, decontextualized language that is independent of people's local home settings, it is reasonable that women who acquire more of the language abilities suited to school performance would also be better able to comprehend the decontextualized language of the health services. But since these women still only comprehended half of the information on average in the language in which they were fluent, they would also need to recognize their lack of full comprehension and ask questions to complete their understanding. At this point, the constraints of relative social status and showing appropriate respect by silence before an authority can inhibit women from seeking fuller comprehension of health instructions or interacting verbally with health authorities. Dexter et al. (n.d.) found evidence of this among Mexican women, and it should be investigated in other settings as well.

These findings on the effects of literacy skills also have implications for health authorities in view of the increasing emphasis on prevention of illness by educating people on basic health and hygiene practices. Since these efforts will only be effective if they are understood by the general public, an awareness by health communicators of the comprehension levels of mothers generally and the influence of their literacy skills on their comprehension could help the health authorities to articulate the messages clearly. Medical personnel would need to recognize the need to check for full comprehension and explain the missed information in face-to-face encounters. This would be especially important when dealing with unschooled women and those having low literacy skills.

For educators, these findings confirm the importance of teaching basic literacy skills in schools, especially to girls who are the future mothers. Educators in poor countries should be commended for their struggle to provide schooling for girls under severe economic restraints, since even low levels of school-acquired literacy skills result in greater understanding of health information for adult women. Also, teachers could benefit by being aware of the importance of modelling decontextualized speech in their oral instruction and encouraging its use by their pupils. But educational policy-makers should beware of the long-term costs to child health of low school quality, since the resulting low levels of oral and print literacy are

likely to reduce the effectiveness of public health education efforts and also reduce child survival.

The most immediate implication of this study, however, is for those seeking to enhance the literacy skills of adult women, especially in poor countries. Encouraging the development of decontextualized language skill in women may be a more direct route to greater understanding of health communications than a narrow focus on print literacy. This emphasis may also enable women to gain print literacy more easily, since decontextualized language ability has been shown to be acquired orally first and then to be a prerequisite to reading comprehension (Snow et al. 1987; Snow 1990). Therefore, adult literacy programs for women may be more effective in increasing the listening comprehension of women when the programs include oral instruction and encourage the women to practise giving information to someone they do not know, for example, a doctor or nurse.

With schooled women who are marginally literate like those in this study, gathering women into small groups to regularly read aloud and discuss health and other information may be a way of adapting literacy enhancement exercises to suit the local context and meet the needs women have for appropriate health education. The format would be familiar to women in this study since church women's groups regularly use it, and 86 per cent of these women are affiliated with Christian churches. Akinnaso (1991) confirms the importance of reading and discussion as a significant literacy event, and this method has been effective in Nepal (Comings, 1995). The current study suggests that it could be used effectively in this and other settings where women with poor literacy skills want health and other types of information applicable to their daily lives.

In summary, these findings identify specific literacy skills as a link between maternal schooling and a mother's comprehension of health information and offer a psycholinguistic explanation of the effects of these skills on a woman's ability to understand and act upon language dealing with new information from outside her home context.

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