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# South African Children's Understanding of AIDS and Flu: Investigating Conceptual Understanding of Cause, Treatment, and Prevention

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## Abstract

The present study examined children's understanding of illness in a peri-urban community in South Africa where AIDS is prevalent ($N$ = 138). Results suggest that children were surprisingly knowledgeable about AIDS at an early age, and may have even erroneously analogized from AIDS to the flu. Furthermore, all age groups attributed different causes for AIDS (transmitted by blood) and flu (casual contagion). However, although factual knowledge about AIDS was identified among all age groups, there was no evidence of understanding biological causal mechanisms. The data have implications both for developmental research on biological reasoning in diverse cultural contexts and for the design of health education programs.

### Keywords

COGNITIVE DEVELOPMENT; UNDERSTANDING AIDS; NAIVE BIOLOGY; SOUTH AFRICAN CHILDREN; THEORIES OF ILLNESS

Culturally situated research investigating children's understanding of biology and health has implications both for theory in cognitive development (Legare & Gelman, 2008) and for informing the design of efficacious educational programs (Au, Chan, Chan, Cheung, Ho, Ip, 2009). Developmental studies on naïve biological reasoning or "folkbiology" have demonstrated that children have complex and often elaborate beliefs about biological processes at very young ages (Inagaki & Hatano, 2002; Kalish, 1999; Legare, Wellman, & Gelman, 2009; Wellman, Hickling, & Schult, 1997). Research on biological reasoning provides evidence for conceptual frameworks of the human mind and cross-cultural universalities, but also suggests potential cultural influences and specificities (Atran, Medin, Lynch, Vapnarsky, Ucan, & Sousa, 2001; Keil, Levin, Gutheil, & Richman, 1999). Investigating children's conceptual understandings in diverse cultural settings is especially important in the domain of illness, given that illness understanding may be particularly open to substantial cultural variation and cultural input (Inagaki & Hatano, 2002).

In the present study, our focus is specifically on children's understanding of biological models of contagion and disease transmission, both because they are important components of biological knowledge and because they illustrate the role of causal reasoning in theory construction. A greater understanding of the folkbiological beliefs linking explanation,

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mechanism, and understanding of biological processes has the potential to provide insight into the complementary function of culture and cognition as co-constructors of core domains of thought (Astuti, 2007).

Despite general agreement among health educators and practitioners that culturally-situated research is needed in the health education field, there is surprisingly little research examining children's beliefs about illness in a cultural context where children have direct experience with and are directly affected by deadly disease. Although considerable research on children's beliefs about health and illness exists, such research primarily focuses on American children (Schonfeld, Johnson, Perrin, O'Hare, & Cicchetti, 1993) and children from several other industrialized countries (such as Japan; Inagaki & Hatano, 2002) where the vast majority of children are no longer exposed to high levels of deadly, contagious diseases in the communities they live in. These relatively privileged populations are not representative of the majority of children globally. Scant literature exists on children's cognitive responses to AIDS, especially among African children (Peltzer & Promtussananon, 2003). By examining children in other cultural contexts, we can examine what is *general* in the development of illness understanding, as well as how the development of illness understanding is contingent upon specific cultural and educational experiences.

In order to examine culturally specific knowledge systems about illness causation, we conducted a developmental analysis of children's understanding of illness and disease transmission in a peri-urban community in the Gauteng province of South Africa. Illness understanding is especially important to study in South Africa because of the peril of infectious disease in this country and the dearth of current research on culturally constructed forms of biological knowledge available to children in this context. The AIDS epidemic in particular poses a significant threat to the well being of South African children and youth (Protasia & Torkington, 2000). In 2005, a national survey documented that 30.2% of pregnant women in South Africa were HIV positive, among the highest rates of HIV infection in the world (Department of Health, 2005).

The objective of this study was to assess participants' understanding of biological mechanisms that cause illness (AIDS and flu). With the exception of studies investigating perceived vulnerability to AIDS exposure and knowledge of factual health-related information about AIDS (Peltzer & Promtussananon, 2003), very little is known about illness understanding in this context. Furthermore, no systematic research has been done investigating children's reasoning about the biological mechanisms at work in the cause, treatment, and prevention of AIDS and the flu in South Africa.

Research on the developmental process by which young (American) children acquire an understanding of AIDS suggests that children have a more sophisticated understanding of colds than of AIDS, and that they generalize their knowledge of the flu and colds to AIDS (Schonfeld et al., 1993; Shoemaker, 1996). For example, U.S. children below 12 years of age often erroneously believe that AIDS is transmitted via casual contagion (sneezing, sharing food). Why this pattern is found is currently unclear. One possibility is that reasoning about AIDS may be intrinsically more difficult for children, because the act of transmission is so far removed (in time and symptoms) from the appearance of one's first symptoms. Alternatively, perhaps American children generalize knowledge about colds to knowledge about AIDS because they have markedly less experience with AIDS than with colds. We can test these two hypotheses by examining illness beliefs in children who live in a context where AIDS is highly prevalent.

Another finding from studies of American children is that grade level (or age) is the single variable most strongly correlated with understanding of causality, treatment, and prevention,

for all illnesses studied (AIDS, colds, and cancer; Schonfeld et al., 1993). There was a systematic developmental sequence of increasing conceptual understanding of these illnesses with age for American children from kindergarten through Grade 6. Again, it will be important to investigate whether this developmental trajectory is universally found, or instead reflects the specific experiences of children in the U.S.

In order to test whether prior findings generalize to the South African context, we assessed children's levels of conceptual sophistication for reasoning about illness processes, with a focus on AIDS and the flu. We predicted that due to higher levels of AIDS awareness, South African children would differentiate AIDS from the flu to a greater extent than is found among American children of the same age. We also predicted that South African children would have greater factual knowledge of AIDS than American children. Nonetheless, we also predicted certain commonalities with past work: overall, children were expected to have a generally appropriate framework for understanding illness (AIDS and flu) as bodily-based biological phenomena that have an identifiable cause, and are not attributable to moral failings.

Participants were asked a series of open-ended questions about the causality, prevention, and treatment of both AIDS and flu. The survey instrument is the ASK (AIDS Survey for Kids, a semi-structured interview protocol developed by Schonfeld et al., 1993), adapted for use in the South African cultural context. We chose this measure based on our interest in assessing children's conceptual understanding of the biological mechanisms involved in illness transmission. In order to move beyond cataloging the facts that children can report about illness, our objective was to directly assess their understanding of relevant concepts.

Assessing how children reason about cause, prevention, and treatment is interesting from both a theoretical and an applied perspective. From a theoretical perspective, we hypothesize that reasoning about *prevention* may be more difficult than reasoning about *treatment*. Treatment is focused on solving a problem at hand, and producing a change in state (from sick to well), and thus may engage children's causal reasoning processes. In contrast, prevention entails reasoning about what is essentially a *non*-effect, with no change in state (from well to well), and thus may fail to engage children's causal reasoning processes (Legare, Gelman, & Wellman, *in press*).

Additionally, due to the urgency of the AIDS crisis and the lack of a true cure, the current emphasis in health education is on providing people with factual information about high risk behaviors known to facilitate or cause HIV infection. Therefore, we expect that there may be more opportunity for children to acquire concrete information about the *causes* of AIDS than the treatment or prevention of the disease. It will be instructive to determine whether this pattern of input results in correspondingly higher levels of knowledge about causes than about treatment or prevention.

## Methods

### Participants

Participants included 5-, 7-, 11-, and 15-year-old Sesotho-speaking children living in a peri-urban settlement outside of Johannesburg in the Gauteng province of South Africa ($N$=32 per age group, total $N$=128). Equal numbers of male and female participants were included. The age ranges were 4.8–5.8, $M$=5.4 for the 5-year-olds; 6.7–7.9, $M$=7.3 for the 7-year-olds; 10.4–12.3, $M$=11.3 for the 11-year-olds; and 14.8–16, $M$=15.4 for the 15-year-olds. The participants came from low-income homes with parents who have little Western-style education. Participants all attended local schools in their community; grades 0, 1, 5, and 9, respectively. For comparison purposes a sample of 10 adults was also interviewed. The

adults were members of the same community as the children and all had less than three years of formal education.

## Measure

The AIDS Survey for Kids (ASK) is an instrument designed to examine children's understanding of the causality, prevention, and treatment of physical illness (Schonfeld et al., 1993). The task is a semi-structured interview lasting approximately 30–40 minutes, based on an interview protocol designed by Perrin and Gerrity (1981). For example, a sample question regarding causality on the ASK is, "How does someone get AIDS (a cold)?" A sample question regarding treatment is, "When someone has AIDS (a cold), can that person get better again? If yes, how does someone get better? If no, why not?" A sample question regarding prevention is, "How can someone keep from getting AIDS (a cold)?"

For this study, only questions relating to AIDS and the flu were included. Because the terms flu and cold are used interchangeably, and "flu" (sefuba in Sesotho) is more commonly used than "cold" among members of this cultural group, the term flu was used instead of cold in this study. The ASK also includes open-ended questions designed to explore conceptual understanding of other domains (e.g., transmission, irreversibility, symptoms), which will not be reported here. Questions concerning children's personal experiences with AIDS and related fears were omitted in order to prevent any potential distress to the participants involved in the study and because they were not pertinent to the causality, treatment, and prevention questions that were the focus of this study.

The interviews were conducted in Sesotho, the native language of the participants. The questionnaire was initially translated into Sesotho from English by native speakers of Sesotho, who were fluent in English, and then back-translated to check for reliability by additional bilingual research assistants. Discrepancies with the translation were resolved using a team of bilingual, native Sesotho speakers.

## Procedure

The adapted ASK measure was administered to each of the participants in the study approximately two weeks following a separate task that also assessed their understanding of AIDS and the flu. Participants completed the ASK measure for both illnesses (AIDS and flu), and the illness order was counterbalanced. The interviewer probed responses until participants either explicitly stated they had no further information or provided circular or redundant responses.

## Coding

Interviews were conducted in Sesotho by several research assistants and were recorded and transcribed verbatim for later blind scoring. The coding scale (from Johnson, Schonfeld, & Perrin, 1991) is organized hierarchically, and was designed to reflect the conceptual sophistication of the child's response, independent of its accuracy. The answers were scored on a scale from 1 to 6 (with a higher score indicating greater knowledge of specific biological mechanisms) for each of the three concepts (causality, treatment, and prevention) and for each of the two illnesses (AIDS and flu), yielding a total of six concept scores for each child. Scores below 3 indicate a lack of information about biologically causal agents or processes involved in illness concepts. A score of 3 requires that the participant name concrete, specific causal agents or actions involved in illness; in other words they must name factual information about the cause, treatment, or prevention of the illness without demonstrating knowledge of a causal mechanism. For example, "someone coughing on you" could cause the flu, but the causal mechanism is not clear. If the participants mentioned the internalization of a causal agent, they received a score of 4. For example, "blood mixing"

may cause AIDS through the internalization of the HIV virus, but the causal mechanism is once again not clear. In order to receive a score of 5, the specific effect of the illness-causing agent had to be stated (e.g., the virus entering the body and killing immune cells). In order to receive a score of 6, the causal mechanism or process had to be elaborated (e.g., white blood cells not working and unable to fight off other sicknesses). Scores of 5 or 6 required that participants mention the specific biological causal process or mechanism of illness, not simply that they identified causal agents or other factual information.

Scoring criteria were parallel across causality, treatment, and prevention questions and did not differ by illness. All interviews were scored by one research assistant using a detailed scoring guide. Thirty randomly selected interviews were scored independently by another research assistant in order to calculate inter-rater reliability. Observed agreement ranged from 89–94% for each concept and illness.

In addition to analyzing data based on conceptual sophistication, we also identified the content of the explanations provided. The coding categories for response content were: blood or sexual contact (e.g., blood mixing); casual contagion (e.g., being sneezed on); moral transgression; bewitchment; or other. Observed inter-rater reliability ranged from 92–96%.

## Results

The mean causality, treatment, and prevention scores for both AIDS and flu indicated high levels of understanding of concrete, specific causal agents or actions among participants (see Figures 1–3). Overall, the results are comparable to data collected using this measure with American elementary school children (grades K-6) (Schonfeld et al., 1993). The distribution of the scores indicates that only one participant (a 15-year-old) received a score greater than 4. The vast majority of participants received a score of 3 or 4 (e.g., 65% of 5-year-olds and over 90% of each of the other age groups received a score of 3 or 4 on the causality measure for AIDS). This level of conceptual understanding implies that although there are high levels of factual knowledge about the causes, treatment, and prevention of AIDS and the flu in this community, there is very little evidence for understanding the specific biological mechanisms involved (e.g., reproduction of pathogens, the role of the immune system).

We next examined the effects of age group, illness type (AIDS vs. flu), and concept (causation, prevention, and treatment) on participants' understanding. We conducted an age group X illness type X dimension (causation, treatment, prevention) repeated measures ANOVA with dimension and illness as within-subjects factors and age group as the between-subjects factor.

We found no main effect for illness type, indicating that overall participants gave equally conceptually sophisticated responses for AIDS and flu. Recall that this result stands in sharp contrast to prior work with American children, who showed a distinct advantage for flu concepts. We did obtain a main effect for dimension, $F(2, 266) = 11.13$, $p < .001$, indicating that as predicted, conceptual sophistication was higher for treatment questions than for cause or prevention questions. There was also a significant dimension X age group interaction, $F(8, 248) = 5.27$, $p < .001$. Post-hoc tests revealed that for causality scores, there was a developmental increase in conceptual sophistication. However, no age differences were found for treatment or prevention scores.

We also obtained a significant illness X dimension interaction, $F(2, 248) = 28.85$, $p < .001$. We performed a series of post-hoc tests using the Bonferroni correction. Overall the conceptual sophistication scores for causality and prevention were significantly higher for

AIDS than flu, $p < .001$. However, conceptual sophistication scores for treatment were significantly higher for flu than AIDS, $p < .001$.

Finally, there was a significant age group X illness X dimension interaction, $F(8, 266) = 2.59$, $p < .01$. Post-hoc tests revealed a developmental increase in conceptual sophistication for AIDS causality only. At age 5, children have no greater conceptual understanding of AIDS than flu. However, by age 7, conceptual sophistication scores for AIDS causality are significantly greater than for flu causality, $p < .01$. By ages 11 and 15, AIDS causality scores continue to be greater than flu causality scores, $p < .001$.

In addition to studying conceptual sophistication, we also examined the content of participants' responses. See Table 1 for responses. Three patterns are clear from these data. First, at no age do participants endorse moral or bewitchment explanations more than minimally. Thus, even the youngest children understand both AIDS and the flu within a biological framework. Second, at all ages, responses clearly differ by illness type ($p$s < .001, two-tailed Fisher's exact tests). Whereas AIDS is typically understood as being caused by blood or sexual contact, the flu is more typically understood as being caused by casual contagion. Third, the youngest children tend to treat AIDS as transmissible by casual contagion—an error previously found in young U.S. children. Post-hoc tests indicated that 5- and 7-year-olds were significantly more likely than 11- and 15-year-olds to erroneously describe casual contagion as a cause of AIDS, $p$s < .05.

## Discussion

The present study examines the broad question of constancies and variation in children's reasoning about illness in diverse cultural settings. As with American children, the data provide evidence for the primacy of biological explanations for illness, even among the youngest children. Despite the abundance of non-biological causal explanations (e.g., bewitchment) in this cultural context (Ashforth, 2005), children and adults primarily endorsed biological causes for AIDS. Nonetheless, children's concepts of illness causality, treatment, and prevention appear to be partially contingent upon culturally specific experiences. Overall, participants gave more sophisticated responses for the causality and prevention measures for AIDS than flu, starting at 7 years of age. This contrasts with prior findings from U.S. samples, and suggests that there is nothing intrinsically difficult about understanding the basics of AIDS transmission early in childhood.

The data also reveal high levels of factual information about illness transmission in the absence of a deeper conceptual understanding of the mechanism, similar to research done with American samples. Even primary school children can identify blood mixing, sleeping with multiple partners, and not using condoms consistently as risk factors for HIV infection. Although causality scores improved with age, conceptual understanding on all measures (causality, treatment, and prevention) plateaued at the level of concrete, factual information, even among 15-year-olds and adults. An understanding of the internalization of pathogens was almost entirely absent from explanations of the cause, prevention, and treatment of disease. Even after several follow-up questions, the internalization and reproduction of viruses and the role of the immune system were never mentioned. These findings are consistent with research on American adolescents' understanding of AIDS, whereby they have learned particular facts (e.g., that HIV may be transmitted by blood) without understanding the underlying mechanism (i.e., that infected blood serves as vehicle for the transmission of viruses) (Schonfeld et al., 1993).

This study provides several important findings that are relevant to health education. From an applied perspective, health education is more effective in preventing the initiation of high-

risk behaviors than modifying pre-existing behavioral patterns, (Schonfeld et al.,1993). Therefore, health education should begin at a young age (Schonfeld, O'Hare, Perrin, Quakenbush, Showalter, & Cicchetti, 1995; Zamora et al., 2006) and be informed by children's beliefs and gaps in their understanding (Carey, 2000).

The primary gap in children's illness understanding identified in this study is the lack of information about causal mechanisms at work in illness transmission. Although children clearly have ample factual information about AIDS and illness, neither children nor adults in this community have access to the information necessary in order to think flexibly about why certain behaviors are or are not conducive to the maintenance of health. Recent work by Zamora et al. (2006), investigating the effects of an HIV and STD prevention program with American adolescents, found that students demonstrated more biology knowledge after learning about mechanisms of disease transmission than those in a control group who learned the same information in a standard rote approach, memorizing factual information about risk factors. Furthermore, increased biological reasoning was linked to better performance at identifying risk behaviors for less well-known STDs. Thus, providing students with information about the biological mechanisms underlying infection directly improves their health understanding (Zamora et al., 2006). Given that providing children with biological causal mechanisms for reasoning about disease transmission is an effective way to reason about risk factors (Au et al., 2009), providing children with information about biological causal principles would be a beneficial addition to the educational curriculum.

Another finding with health implications is that, as predicted, reasoning about *preventing* illness was more difficult than reasoning about *treating* illness. This result provides support for the premise that prevention may generally be more difficult to reason about than treatments or cures. We hypothesize that the reason for this difference is that prevention involves neither a change-in-state nor a problem to be solved, and therefore is less cognitively compelling than treatment, which involves both state-change and a problem event.

From an educational perspective, it is important to identify not only the gaps in children's knowledge, but also their misconceptions (Carey, 2000). Several misconceptions were identified in the present study. There was relatively high endorsement of inaccurate, casual contagion beliefs about AIDS (e.g., that one can contract AIDS from being sneezed on), especially among the two youngest age groups. It is striking that this misconception persisted, despite the overall high level of awareness of AIDS in this community. This result is similar to that found in middle-class American children, and suggests that there may be a general tendency, across different cultural contexts, for young children to endorse contagion as a mechanism for disease transmission. Additionally, children often misinterpreted factual information about AIDS in the absence of a biologically based understanding of disease transmission. For example, several children indicated that they knew AIDS was associated with sleeping, but interpreted this literally to mean that being asleep (not sex) could cause AIDS. Without an understanding of the mechanism involved in disease transmission (i.e. pathogen reproduction), disconnected, factual information is especially open to misinterpretation.

Given the urgency of the AIDS crisis, the current emphasis in educational intervention research is on prevention of the disease. Prevention needs to involve educational programs founded on children's knowledge about AIDS (Au, 1996). The present study provides information on the development of illness understanding in South Africa. Even the youngest children in this study displayed high levels of factual knowledge about AIDS, in contrast with American middle-class children. Nonetheless, their knowledge was not accompanied by more than minimal causal understanding. This result has especially important educational

implications in light of research demonstrating the importance of understanding causal mechanisms (Au et al., 2009). Explicit instruction concerning the role of microorganisms in AIDS and illness in general would therefore be a useful complement to the curriculum.

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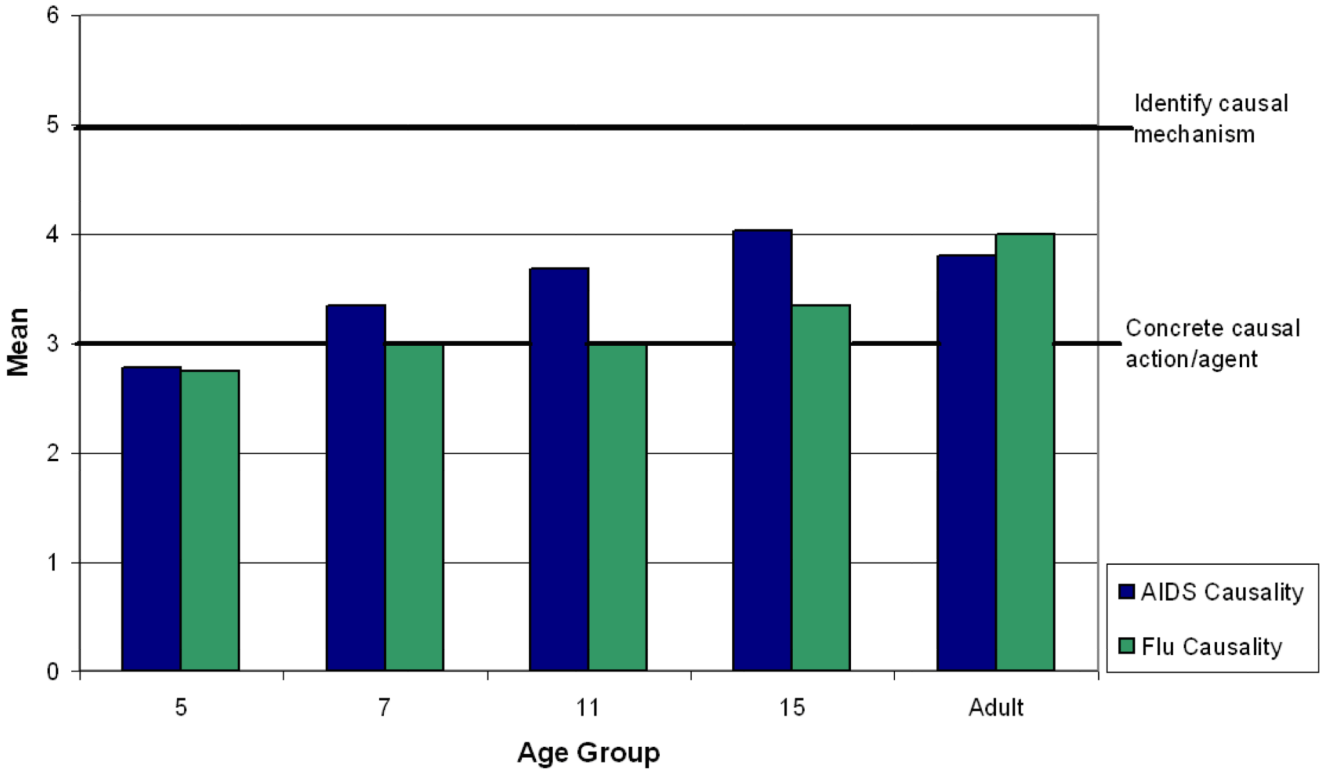


**Figure 1.**
Study 1, Mean causality score on the ASK Survey (scores out of 6).

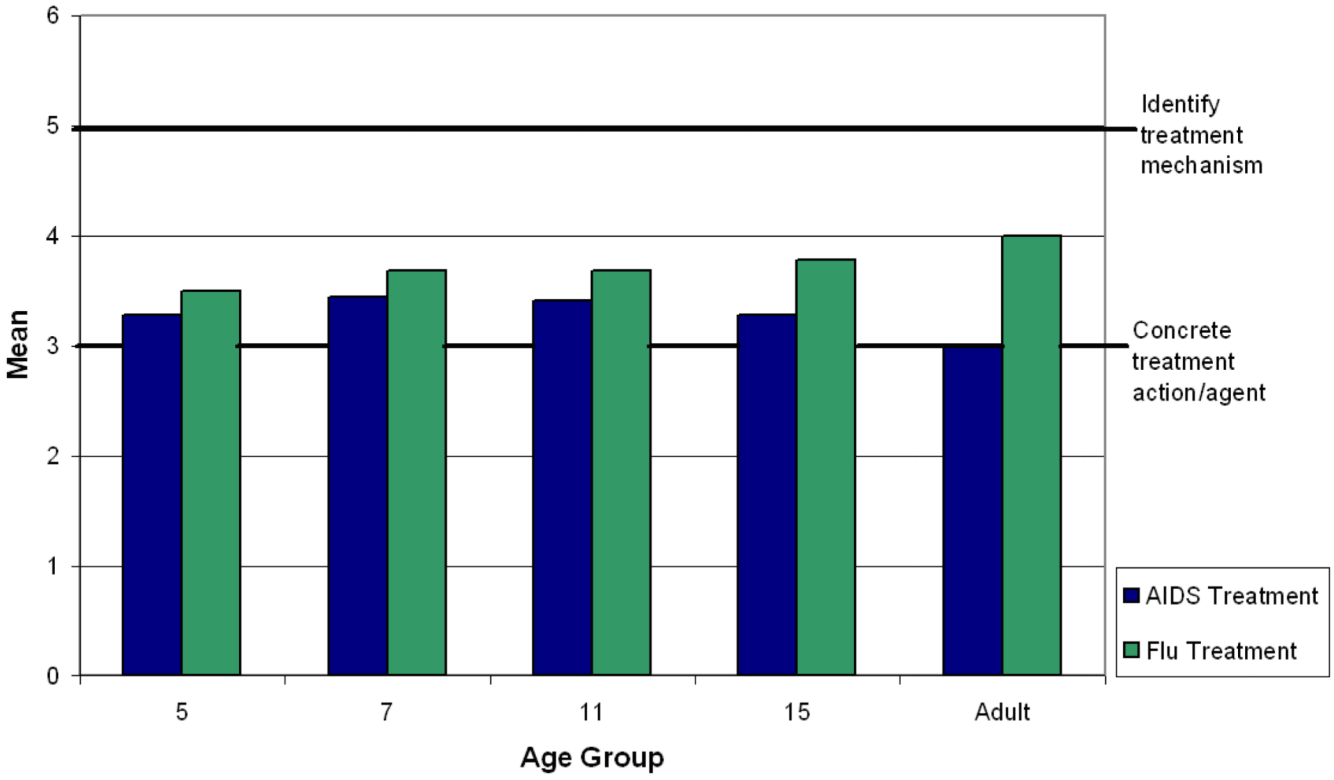


**Figure 2.**
Study 1, Mean treatment score on the ASK Survey (scores out of 6).

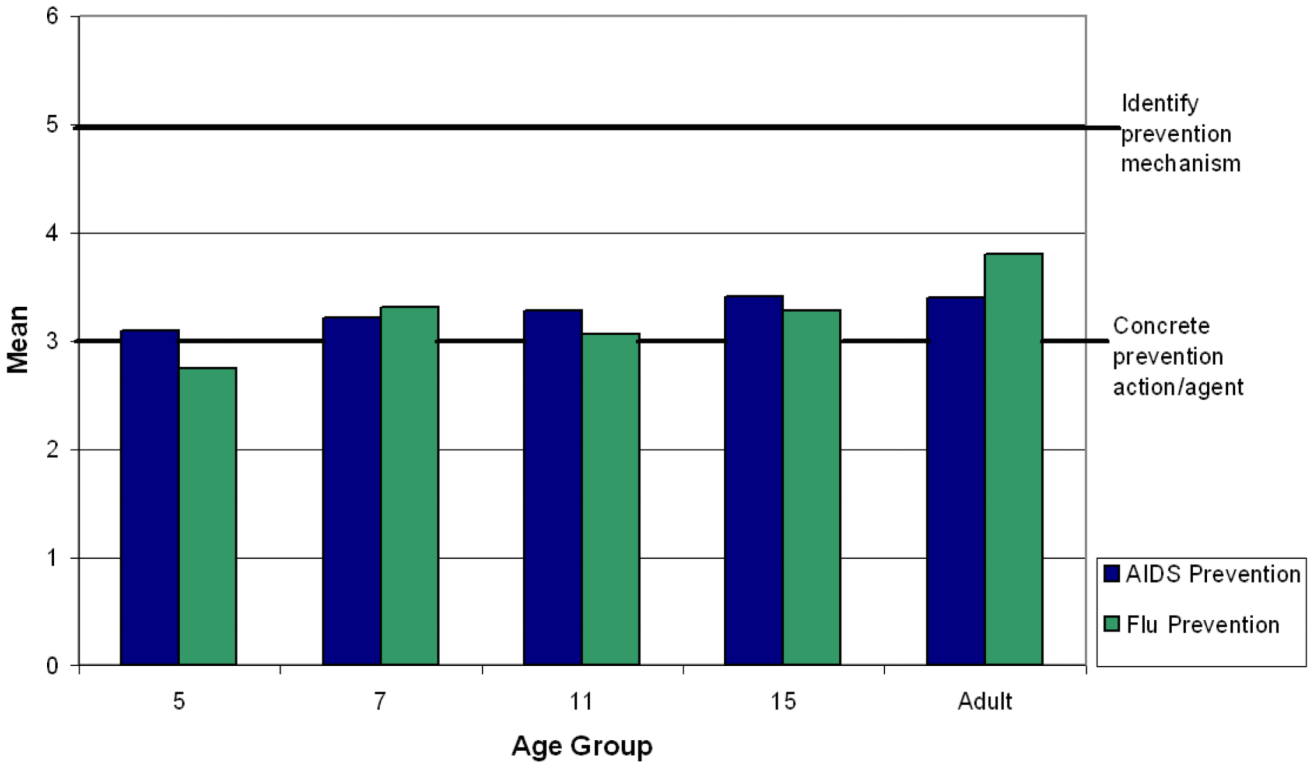


**Figure 3.**
Study 1, Mean prevention score on the ASK Survey (scores out of 6).

**Table 1**

Percentage of participants mentioning each of four kinds of content in their causal explanations for AIDS and the flu (by age group and content type). Note: participants could provide more than one kind of content; therefore scores can add to more than 100%.

| **(a) AIDS** | | | | | |
|---|---|---|---|---|---|
| **Content type:** | **5 years** | **7 years** | **11 years** | **15 years** | **Adults** |
| Biological blood | 44 | 69 | 100 | 100 | 100 |
| Biological casual contagion | 66 | 72 | 31 | 22 | 28 |
| Moral | 0 | 0 | 0 | 0 | 0 |
| Witchcraft | 0 | 6 | 6 | 0 | 35 |

| **(b) Flu** | | | | | |
|---|---|---|---|---|---|
| **Content type:** | **5 years** | **7 years** | **11 years** | **15 years** | **Adults** |
| Biological blood | 0 | 0 | 0 | 0 | 0 |
| Biological casual contagion | 100 | 100 | 100 | 100 | 100 |
| Moral | 0 | 0 | 0 | 0 | 0 |
| Witchcraft | 0 | 0 | 0 | 0 | 0 |

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