**Knowledge Impact of a US-based Tobacco Prevention Curriculum Among Tanzanian Children**

**ABSTRACT**

**PURPOSE:** Growing tobacco use is a major public health issue in developing countries, with substantial initial exposure in childhood. School-based educational resources promise to reduce tobacco initiation and experimentation among children from low-income countries. Research in this area is scant. The study goal was to test the impact of an evidence-based US educational resource on tobacco use health risk knowledge among Tanzanian children. **METHODS:** *Eglin Long-Horn of Nightshade County* is a potentially transferable children’s storybook/curriculum focused on reducing tobacco use intent. A pre-/post-survey assessed the impact of “Eglin” on knowledge of tobacco exposure health risks among secondary school-age residents of a Tanzanian orphanage. **RESULTS:** Of 52 participants; 35 returned both surveys. School grade ranged from Forms 1-4, with 51% in Forms 1-2 (ages 14-15). There was an overall increase from 60% to 93% (p<0.0001) of correct survey responses, with increase seen in all grade levels. **CONCLUSION:** A US-based tobacco awareness storybook/curriculum improved Tanzanian children’s knowledge of tobacco use health risks.

**INTRODUCTION**

Increasing tobacco use is a major public health crisis in developing countries like Tanzania (Agaku, Adisa, Akinyamoju, & Agboola, 2013; Bauer C, 2015; Guindon E, 2003). Efforts to reduce global tobacco addiction rates should be directed at children because most tobacco users start before the age of 18 years (Bauer C, 2015). Youth underestimate the hazards of tobacco use and the risk of addiction to these products (Amrock & Weitzman, 2015; Slovic P, 2000). Furthermore, the likelihood of addiction is greater the earlier the exposure to tobacco (Bauer C, 2015; Breslau N, 1996; DiFranza J, 2011). According to WHO data, 250 million youth who continue smoking into adulthood will die from tobacco-related diseases, including cancer; focused concern is on under-resourced countries where 80% of the world's children live (World Health Organization, 2015b). These data highlight the need for tobacco-related educational efforts among children from low-income countries aimed at early awareness of the health hazards of tobacco use and prevention of tobacco use initiation, as well as advocacy efforts directed at limiting childhood tobacco exposure.

Data from Dar es Salaam, the largest city in Tanzania, reveals that nearly two-thirds of tobacco users are exposed initially before the age of 12 years (Kaduri P, 2005). Lack of awareness of the hazards of cigarette and non-cigarette tobacco products are presumed to contribute to the initiation of tobacco use among Tanzanian children. To date, there have been limited tobacco educational resources available to parents, public health officials, and teachers in Tanzania. In contrast, educational and awareness resources are more plentiful in developed countries, including the United States (US). We hypothesized that select, validated US-based educational materials are transferable to the Tanzanian context, and will improve the school-aged child’s knowledge of the health hazards of tobacco use. The goal of this work was to test this hypothesis through examination of the knowledge impact of an existing evidenced-based US educational storybook/curriculum, *Eglin Long-Horn of Nightshade County* (Wert, 1998), among a cohort of Tanzanian secondary school children.

**METHODS**

***Educational Resource***

*Eglin Long-Horn of Nightshade County* (Wert, 1998)*,* written by a US health education specialist, is a potentially transferable and translatable children’s storybook that is focused on increasing awareness among elementary school-aged US children of the health hazards of tobacco use, with the goal of reducing tobacco use intent. The *Eglin Long-Horn of Nightshade County Teacher’s Guide*,used in conjunction with the storybook, was developed as a tool to guide parents, other relatives, and teachers in educating children about the importance of tobacco use prevention.

Through the experiences of a grasshopper, *Eglin,* the book allows the child and educator to explore the chemical makeup of tobacco, the physiological, cosmetic, and social consequences of tobacco use, as well as the long-term health risks of tobacco use, including the risks of second-hand smoke exposure. Previous study of the impact of this book among a representative sample of over 1700 American primary school children from 97 Florida schools revealed a significant increase in knowledge of the health hazards of tobacco use among the children exposed to the book/curriculum compared with those from a comparison group not exposed to this resource (James D, 2003).

Through review of available evidence-based US educational resources aimed at reducing tobacco use initiation among young children, the study team selected *Eglin Long-Horn of Nightshade County* for this work because it was: i) potentially culturally and socially transferable to the Tanzanian context, ii) testable within the local setting, and iii) relevant for both school and residential use.

***Survey Instrument***

A validated survey instrument developed for earlier study of the educational impact of *Eglin Long-Horn of Nightshade County* among young children was used for this work. The survey contains 34 questions including: 16 questions reflecting knowledge of tobacco use health hazards, and 18 questions reflecting knowledge of insects and understanding of vocabulary used in the storybook. As our study was focused on examining the impact of this US-based educational resource on children’s knowledge of the health consequences of tobacco use, our pre-/post-survey instruments included only the 16 knowledge-based questions focused on the health hazards of tobacco use.

***Study Setting and Subjects***

Both the public sector and the [private sector](https://en.wikipedia.org/wiki/Private_sector) are involved in the Tanzanian education system. The general structure includes two years of pre-primary education for ages 5–6, followed by seven years of primary education for ages 7–13 (Standard I-VII), four years of secondary ordinary level education for ages 14–17 (Form 1-4), two years of secondary advanced level education for ages 18–19 (Form 5 and 6), concluding in three or more years of university education. There are no tuition costs for students attending government primary schools; however, families pay for school supplies. Tuition fees are levied beginning in Form 1 (secondary school).

Kiswahili is Tanzania’s official language that is used as the means of instruction in primary schools. English is taught as a subject from year three of primary school onwards, and it is the language of instruction in secondary schools and post-secondary institutions of higher learning. All primary school textbooks, except English textbooks, are written in Kiswahili. English textbooks are used in secondary schools and institutions of higher learning. Because of concerns about potential language barriers among younger (primary school) children, this work involved secondary school children (Forms 1-4).

The storybook was tested as a means to increase knowledge of the health hazards of tobacco use among a cohort of self-selected residents of a permanent children’s home for orphans, founded by an American in partnership with a Tanzanian. Two members of the study team had established working relationships with the organization’s administrators and approval for this work was secured from its Director. This work was determined exempt from IRB approval because it was focused on education/curriculum development. All data was collected without participant identifiers.

***Test of Educational Resource***

With the support of the *Teacher’s Guide*, an American orphanage volunteer with education background facilitated the *Eglin Long-Horn of Nightshade County* test. The volunteer met with study participants during their 2014-2015 winter school break to read and review the book’s contents over the course of one week. Following completion of the pre-survey, the volunteer directed students in reading the storybook, engaged them in discussion of the book, and collected post-surveys.

All study materials were presented in English, including the storybook and pre-/post-survey instruments.

***Statistical Methods***

We used proportions to describe categorical variables and means to describe continuous variables. Paired t-tests were utilized to assess statistical significance of pre/post differences in the knowledge scores (the proportion of knowledge questions answered correctly).

**RESULTS**

***Participants***

A total of 52 children participated in this study. All read and reviewed the book’s contents in the presence of the study-affiliated orphanage volunteer, and responded to pre-/post-survey*s.* A total of35 returned both surveys; 17 returned only one survey (pre- or post-). The Table shows that among the total cohort of 52 children, school grade ranged from Form 1-Form 4 (ages 14-17 years). Among those participants returning both surveys, the majority (51%) were in Forms 1-2 (ages 14-15); six students (17%) did not report a grade; two noted they were pre-Form 5.

***Survey Results***

The Figure shows that among those returning both surveys, there was a statistically significant increase in the percentage of knowledge questions answered correctly from 60% to 93% (p<0.0001). Increased knowledge was seen among all grades studied. Among the younger children (Forms 1-2), pre- and post-scores appeared lower than among older children (Forms 3-4). In contrast, the total increase in scores was greater among the younger group (increase in percentage of correct responses totaling 35% and 30%, respectively).

**DISCUSSION**

Tobacco is among the most preventable causes of morbidity and mortality worldwide. Globally, over five million deaths (the equivalent of one in ten deaths) annually are attributed to tobacco use (World Health Organization, 2015a). This number is expected to exceed eight million in 2030 (World Health Organization, 2008 ), with at least 80% of these deaths occurring among those from developing countries (World Health Organization, 2013, 2008 ).

Most adult smokers become addicted in their teen years. The need for effective educational/awareness resources focused on educating children on the health hazards of tobacco use as a means to reduce tobacco-use intent has been acknowledged globally (Bauer C, 2015). Despite calls for tobacco prevention efforts in low income countries, youth-focused educational capacity building, research and advocacy in this area has been limited in countries like Tanzania (Kaduri P, 2005) (World Health Organization, 2015a) (Agaku, Ayo-Yusuf, Vardavas, & Connolly, 2014; Samet J, 2010; Steptoe et al., 2002; U.S. Preventive Services Task Force, 2013; World Health Organization, 2006). Without focused attention dedicated to these issues from a range of stakeholders, 250 million youth smokers globally who continue to smoke into adulthood will die of smoking-related causes (World Health Organization, 2015b).

Nicotine addiction follows five established stages: i) susceptibility to smoking (never smoked), ii) initiation (trying the first cigarette), iii) experimentation (repeatedly trying cigarettes - early signs of addiction), iv) establishment of smoking (regular smoking - likely signs of addiction), and v) nicotine dependence (Bauer C, 2015). Children are particularly vulnerable to stages ii) initiation and iii) experimentation. Transition from experimentation to addiction typically takes up to two years, although children may be susceptible to more rapid dependence (Bauer C, 2015; DiFranza J, 2011). US-based evidence shows that community/school-based educational efforts reduce the risk of smoking initiation in children and adolescents (U.S. Preventive Services Task Force, 2013). Studies of community/school-based educational resources to improve knowledge of the hazards of tobacco use among Tanzania children have been scant, and the adaptability/transferability of existing US resources to the Tanzanian context is uncertain.

Using lessons learned from an evidence-based American educational and awareness resource that was viewed as potentially transferable and culturally relevant to the Tanzanian context, *Eglin Long-Horn of Nightshade County* was selected for testing among secondary school-aged children from Northern Tanzania. Through pre-/post- evaluation of knowledge gained, this work revealed that this US-based resource increased knowledge of the health hazards of tobacco use among the self-selected cohort studied. To our knowledge, this is the first test of the effectiveness of this type of US-based educational resource in Tanzania.

Through seed funding from the American Society of Clinical Oncology, this work capitalized on existing US-Tanzanian professional and community-based partnerships and facilitated involvement of education experts. It included a range of stakeholder groups - public health, medicine, education, and orphanage leaders, who have interest in the long-term health of Tanzanian children. Although this work builds onexisting efforts to prevent initiation of tobacco use among children in the United States, it is innovative in its extension of this work to the Tanzanian context. It is unique in its involvement of end-users and lay educators.

Although a concern at study outset, language and cultural barriers did not seem to be impediments to successful completion of this work. Specifically, although Kiswahili is the primary language in Tanzania, the study involved English versions of the storybook and survey instruments. This did not appear to affect either the review of the storybook or the completion of pre-/post-surveys. Furthermore, as the book’s principal character was an insect, there were no apparent major cultural or social barriers to using this educational resource within the context of the study.

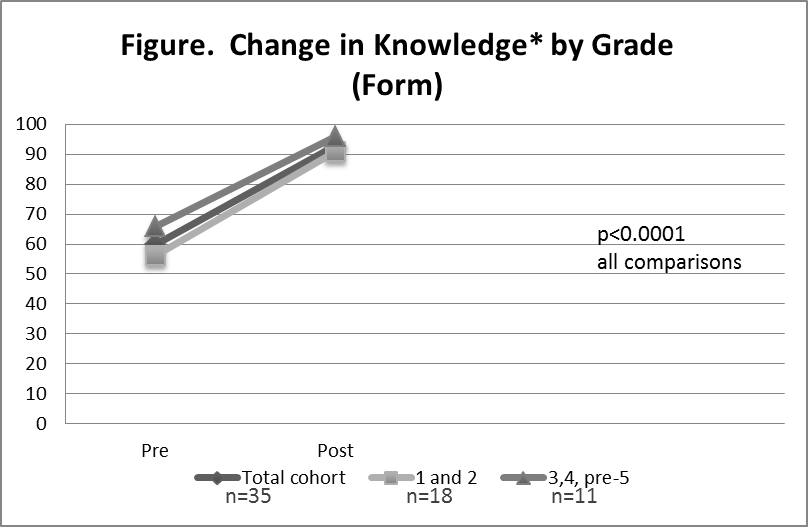
There are significant limitations to this study. Most importantly, it involved a small self-selected cohort of secondary school children residing in a permanent home for orphaned children. Furthermore, the study involved a volunteer from the US working within the organization. This limits the generalizability of this work to the greater Tanzanian school and home context. It also limits the transferability of study results to younger Tanzanian children, which is significant given the book was developed for elementary school-aged US children. In addition, we only measured improvement in knowledge of the health risks of tobacco use. We did not assess changes in the students’ attitudes or intent to initiate tobacco use. This is a noteworthy limitation of this study, as improved knowledge may not translate into reduced exposure to tobacco products in Tanzania. Finally, we did not assess children’s overall satisfaction with the storybook, an important issue relative to utility, scalability, and sustainability. Next steps in this work include examination of the impact of this educational resource among a broader population of Tanzanian children within the school-based setting.

**CONCLUSION**

A US-based educational storybook/curriculum holds promise to increase knowledge of tobacco use health risks among children from a low resource setting. Language and cultural barriers did not seem to impede completion of this study. Select existing educational resources to prevent childhood tobacco-use initiation in high-income countries may be transferable to the Tanzanian context. Further research and advocacy in this area is needed.

**Table. Education Level of Study Participants**

|  |  |  |
| --- | --- | --- |
| Grade level | Total  (n=52) | Completing both surveys (n=35) |
| Form, n (%)  1  2  3  4  Pre5  Missing grade | 9 (17%)  14 (27%)  6 (12%)  11 (21%)  2 (4%)  10 (19%) | 7 (20%)  11 (31%)  3 (9%)  6 (17%)  2 (6%)  6 (17%) |



\*Mean percentage of correct responses

**References**

Agaku, I., Adisa, A., Akinyamoju, A., & Agboola, S. (2013). A cross-country comparison of the prevalence of exposure to tobacco advertisements among adolescents aged 13-15 years in 20 low and middle income countries. *Tob Induc Dis, 11*(1), 11. doi:10.1186/1617-9625-11-11

Agaku, I., Ayo-Yusuf, O., Vardavas, C., & Connolly, G. (2014). Predictors and patterns of cigarette and smokeless tobacco use among adolescents in 32 countries, 2007-2011. *J Adolesc Health, 54*(1), 47-53. doi:10.1016/j.jadohealth.2013.07.037

Amrock, S., & Weitzman, M. (2015). Adolescents' perceptions of light and intermittent smoking in the United States. *Pediatrics, 135*(2), 246-254. doi:10.1542/peds.2014-2502

Bauer C, K. C. (2015). Youth and Tobacco. In K. M. Loddenkemper R (Ed.), *The Tobacco Epidemic* (Vol. 42, pp. 158-170). Basel: Karger.

Breslau N, P. E. (1996). Smoking Cessation in Young Adults: Age at Initiation of Cigarette Smoking and Other Suspected Influences. *American Journal of Public Health, 86*, 214-220.

DiFranza J, W. R., Mermelstein R, Pbert L, Klein J, Sargent J, Ahluwalia J, Lando H, Ossip D, Wilson K, Balk S, Hipple B, Tanski S, Prokhorov A, Best D, Winickoff J. (2011). The Natural History and Diagnosis of Nicotine Addiction. *Current Pediatric Reviews, 7*, 88-96.

Guindon E, B. D. (2003). Past, Current and Future Trends in Tobacco Use. *Tobacco Free Initiative.* Retrieved from <http://documents.worldbank.org/curated/en/2003/03/4045681/past-current-future-trends-tobacco-use>

James D, C. W., Lindsey R,. (2003). Evaluation of a Tobacco Prevention Curriculum for Elementary School Children. *Health Educator, 35*(2), 3-8.

Kaduri P, G. T., King G, Mbwambo J, Kilonzo G, Flisher A, Matthews S,. (2005). Social networks' influence on tobacco use among students in Dar es Salaam, Tanzania. *Promotion & Education, 12*(2), 66-70.

Samet J, S.-Y. Y., World Health Organization,. (2010). 7. Addiction to Nicotine *Gender, Women, and the Tobacco Epidemic* Geneva, Switzerland: World Health Organization.

Slovic P. (2000). What Does it Mean to Know a Cumulative Risk? Adolescents' Perceptions of Short-term and Long-term Consequences of Smoking. *Journal of Behavioral Decision Making, 13*, 259-266.

Steptoe, A., Wardle, J., Cui, W., Baban, A., Glass, K., Tsuda, A., & Vinck, J. (2002). An international comparison of tobacco smoking, beliefs and risk awareness in university students from 23 countries. *Addiction, 97*(12), 1561-1571.

U.S. Preventive Services Task Force. (2013). Tobacco Use in Children and Adolescents: Primary Care Interventions. Retrieved from <http://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/tobacco-use-in-children-and-adolescents-primary-care-interventions>

Wert, D. (1998). *Elgin Long-Horn of Nightshade County*. Shepherdstown, WV: Rocky River Publishing.

World Health Organization. (2006). Regulation Urgently Needed to Control Growing List of Deadly Tobacco Products: Media Centre. Retrieved from <http://www.who.int/mediacentre/news/releases/2006/pr28/en/>

World Health Organization. (2013). mpower. *Tobacco Free Initiative.* Retrieved from <http://www.who.int/tobacco/mpower/en/>

World Health Organization. (2015a). The Millenium Development Goals and Tobacco Control. Retrieved from <http://www.who.int/tobacco/control/populations/youth/en/>

World Health Organization. (2015b). Tobacco and Youth. *Tobacco Free Initiative.* Retrieved from <http://www.who.int/tobacco/control/populations/youth/en/>

World Health Organization. ( 2008 ). mpower. *Tobacco Free Initiative.* Retrieved from <http://www.who.int/tobacco/mpower/2008/en/>