

Additional file 10: Evaluating “far transfer” of learning, and evaluating and monitoring potential harms

Evaluating “far transfer” of learning

If people are unable to “transfer” what they learn in school to other contexts, the value of a formal education is limited (Barnett and Ceci, 2002). As follows, if students are unable to transfer skills that they learn from the IHC secondary school intervention, the value of the intervention is limited. The more different the transfer context is from the learning context, the “further” the transfer. There is often uncertainty about how best to evaluate far transfer (Barnett and Ceci, 2002).

The primary outcome measure for the trial—the multiple-choice items from the Claim Evaluation Tools bank—is a measure of near transfer. In other words, applying the nine IHC Key Concepts within the context of the intervention (the learning context) is similar overall to applying them to the Claim Evaluation Tools items (the transfer context), although there are important differences. For example, in both contexts, students are intended to apply the concepts to hypothetical scenarios, as opposed to practical decisions. On the other hand, in the context of the intervention, students are intended to apply the concepts together, guided by their teachers, while in the context of the assessment, they are intended to apply them independently.

In a separate study, parallel to the preparation and publication of this protocol, we are developing a model to identify possible intermediate and far transfer effects of our intervention, such as application of concepts to practical decisions. Based on the model, we will determine methods and develop measures for evaluating those effects.

Evaluating potential harms

Researchers and others often overlook potential adverse effects of educational interventions (Zhao, 2017, 2018) and public health interventions (Lorenc and Oliver, 2014; Bonell *et al.*, 2015). In another separate study, we are developing a framework of potential adverse effects of the IHC secondary school intervention, informed by expert and stakeholder feedback, including input from teachers familiar with the project. Based on the framework, we will determine methods and develop measures for evaluating any potential adverse effects. Table 1 shows the undesirable outcomes in the framework as of preparing and publishing the protocol for the trial.

Table 1. Potential undesirable outcomes

Category	Undesirable outcome¹
<i>Decision-making harms</i>	Incorrect or unnecessary application of learning
	Misunderstanding
	Overconfidence
	Inappropriate distrust ²
<i>Psychological harms</i>	Cynicism or pessimism ³
	Uncomfortable cognitive dissonance
	Work/schoolwork-related stress
<i>Equity harms</i>	Benefit-based inequity
	Harm-based inequity
<i>Group and social harms</i>	Conflict
<i>Waste</i>	Wasted time or resources
<i>Any</i>	Other

¹The adverse effect would be an increase in the undesirable outcome.

²Distrust might also be a psychological harm.

³Cynicism or pessimism might also be a decision-making harm.

Monitoring for potential harms

Serious adverse effects of the IHC secondary school intervention are unlikely based on results of the trial of the IHC primary school intervention (Nsangi, Semakula, Oxman, *et al.*, 2020), and process evaluation for that trial (Nsangi *et al.*, 2019). Moreover, we have taken steps to prevent potential adverse effects of the secondary school intervention, informed by 1) findings and experiences from the development (Nsangi, Semakula, Rosenbaum, *et al.*, 2020) and evaluation of the primary school resources; 2) findings from piloting and user-testing prototypes of the secondary school resources, as part of the human-centred design approach (Rosenbaum *et al.*, 2019); and 3) early versions of the framework of potential adverse effects, including theoretical mechanisms. For example, in the teaching resources, we explicitly address limitations of the intervention, such as the limited number of IHC Key Concepts covered. Acknowledging this limitation is intended to prevent users from becoming overconfident in their ability to make informed choices.

Nonetheless, in the lessons that we observe during the trial, we will monitor for adverse outcomes, including those specified in the framework, and we will ask teachers to report any adverse outcomes to the primary investigator. We will not ask teachers to monitor for specific adverse outcomes, which again are unlikely, especially within the study period, and might also be difficult for teachers to understand and identify (e.g. uncomfortable cognitive dissonance). This is to avoid nocebo effects and unnecessary confusion or stress. If a teacher asks for an example of an adverse outcome, we will provide as many as necessary, starting with those in the framework that are relatively likely during the study period, and relatively easy to understand and identify, such as conflict.

References

- Barnett, S. M. and Ceci, S. J. (2002) 'When and where do we apply what we learn? A taxonomy for far transfer', *Psychol Bull.* WASHINGTON: WASHINGTON: AMER PSYCHOLOGICAL ASSOC, 128(4), pp. 612–637. doi: 10.1037//0033-2909.128.4.612.
- Bonell, C. *et al.* (2015) "'Dark logic": Theorising the harmful consequences of public health interventions', *Journal of Epidemiology and Community Health*, 69(1), pp. 95–98. doi: 10.1136/jech-2014-204671.
- Lorenc, T. and Oliver, K. (2014) 'Adverse effects of public health interventions: A conceptual framework', *Journal of Epidemiology and Community Health*, 68(3), pp. 288–290. doi: 10.1136/jech-2013-203118.
- Nsangi, A. *et al.* (2019) 'Informed health choices intervention to teach primary school children in low-income countries to assess claims about treatment effects: Process evaluation', *BMJ Open*, 9(9), p. e030787. doi: 10.1136/bmjopen-2019-030787.
- Nsangi, A., Semakula, D., Rosenbaum, S. E., *et al.* (2020) 'Development of the informed health choices resources in four countries to teach primary school children to assess claims about treatment effects: A qualitative study employing a user-centred approach', *Pilot and Feasibility Studies*, 6(1), p. 18. doi: 10.1186/s40814-020-00565-6.
- Nsangi, A., Semakula, D., Oxman, A. D., *et al.* (2020) 'Effects of the Informed Health Choices primary school intervention on the ability of children in Uganda to assess the reliability of claims about treatment effects, 1-year follow-up: A cluster-randomised trial', *Trials*. *Trials*, 21(1). doi: 10.1186/s13063-019-3960-9.
- Rosenbaum, S. *et al.* (2019) *Human-centred design development of Informed Health Choices (IHC) learning resources for secondary school students: Protocol*. Available at: <https://www.informedhealthchoices.org/publications>.
- Zhao, Y. (2017) 'What works may hurt: Side effects in education', *Journal of Educational Change*. Springer Netherlands, 18(1), pp. 1–19. doi: 10.1007/s10833-016-9294-4.
- Zhao, Y. (2018) *What works may hurt: side effects in education*. New York: Teachers College Press.