

Remove barriers to technology adoption for people in poverty

Financial, informational and other constraints lower the adoption of welfare-improving technologies amongst people living in poverty. Field trials have identified effective strategies to facilitate behaviour change. Researchers and policymakers need to apply this knowledge, and form institutional partnerships to implement solutions at scale.

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The ongoing struggle to contain the COVID-19 pandemic has brought into sharp relief how difficult it is to change people's behaviour. Despite the scientific consensus that universal masking and vaccinations can limit viral transmission, it has been immensely difficult to achieve widespread take-up. That behaviour change is hard to achieve is not news for researchers in the behavioural sciences and for policymakers. Even before COVID-19, a central puzzle has been the slow adoption of effective, inexpensive technologies and behaviours with the demonstrated potential to address threats to health and development.

Understanding low adoption is a fundamental challenge that stretches far beyond the present pandemic, and successfully encouraging behaviour change will have enormous welfare consequences. A billion people still defecate in the open and poor sanitation is estimated to kill 280,000 people globally. The World Health Organization estimates that indoor air pollution, linked to burning biomass on low-quality cookstoves, causes nearly four million deaths per year — mostly in developing countries — even though cleaner stove technologies clearly exist. Low adoption of new seed varieties, fertilizer or farming techniques has kept agricultural productivity low and stagnant in Africa during a period in which yields have improved tremendously on other continents. Hundreds of millions of people who live in rural, agrarian areas face seasonal deprivation and hunger but do not migrate to nearby cities that offer higher wages during these periods.

Living conditions in developing countries could be improved through the large-scale deployment of welfare-improving technologies with the potential to address these challenges, including health products (immunizations, insecticide-treated bed nets, toilets and better-quality cookstoves), agricultural technologies (improved seed



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varieties, fertilizer and labour-saving technologies), financial services (insurance products and savings vehicles), and rational-response behaviours that improve economic productivity (such as rural–urban migration). There are social and political determinants of technology adoption that create systematic barriers but also individual-level constraints that deserve our attention.

Applied behaviour change research has generated actionable insights for researchers and policymakers on how to identify the most relevant constraints and how to overcome them.

Barriers to adoption

When investigating the low adoption of a product with positive net benefits, the two most frequently cited explanations by both researchers and practitioners are (1) a lack of money to invest in the new product and (2) a lack of information or awareness among users about the problem and possible solutions. Beyond these two

frequently considered issues, there are other barriers that people living in poverty face in the context of behavioural change, such as risk aversion and the expected norms of behaviour set by others around them.

Lack of money. The ‘lack of money’ hypothesis signals not only that people may not have the money to invest, but also that they are also unable to borrow or save for it. Research on insecticide-treated bed nets with the potential to reduce malaria transmission has found that users are extremely price-sensitive. However, giving them micro-loans helps to spur adoption and can be a sensible policy if repayment can be enforced¹. If the benefits from product adoption accrue over time but the cost has to be paid upfront, then loans are a sensible instrument to address that barrier to adoption. Direct subsidies could also address this constraint, but many prominent practitioners and the popular media have voiced concerns that this decreases product valuation or leads to misuse (although

these concerns have not held up under rigorous experimental scrutiny²). Subsidies provide individuals with an opportunity to experiment with a new product, which could change adoption in subsequent periods or generate new demand amongst friends and neighbours³.

Information failures. Another explanation for low adoption rates is a lack of information about the importance of the problem or the existence of solutions. If potential users do not make the link between smoke produced by biomass-burning cookstoves and respiratory infections, they will not pay attention to clean cooking technology. Similarly, if they are unfamiliar with healthier technology options, this will act as a barrier to adoption⁴.

Information barriers could take on more complicated forms, beyond simple awareness. Users will need to decide whether the new information is relevant for their own individual situation — and the information needs to be sufficiently clear and convincing — before they switch to a new behaviour. This depends on characteristics of new information: who the source of the information is, the proximity and similarity of the source to user, the nature of their relationship and relevance of the information for this user's specific concerns.

To convince farmers living in poverty in South Asia to switch to a new seed variety, it is not sufficient to state that the new seed improves yields in laboratory and field trials or on demonstration plots in Mexico or the Philippines. Farmers may be concerned about how the new technology will perform given their own soil conditions, rainfall patterns, farming techniques or skills, or access to other complementary farming inputs. To overcome such concerns, they may need to observe the performance of a new seed or technique on their neighbours' plots, which have agronomic conditions that are most similar to their own. Experiments in Malawi show that social learning from 'peer farmers' (as opposed to outside extension workers, or even 'lead farmers' within the village)⁵, as well as the nature of social network relationships⁶, mediate decisions to adopt technology. Networks can also pass on information about negative product attributes, thereby preventing the adoption of inefficient technologies⁷.

The natural learning process via networks can be slow, which has important welfare implications. Green revolution technologies ultimately transformed agricultural productivity and food security in South Asia, but those new technologies took 30–40 years to fully diffuse across the population.

The welfare gains of speeding up that diffusion process by 10 or 15 years would have been enormous, but that would require deliberate interventions by policymakers (for example, providing incentives to peer farmers to spread information)⁵.

Risk aversion. People need context-specific information from their peers because adopting a new technology with uncertain benefits and costs can be risky. Risk aversion is an important impediment to technology adoption for people living in extreme poverty. People close to their subsistence constraints may not be able to take advantage of investment opportunities that are highly profitable in expectation if there is even a small downside risk of loss that threatens them to take them below subsistence. The fear of loss could thus produce a poverty trap.

Risk aversion explains underinvestment in the highly profitable act of migration from poor, agrarian regions of Bangladesh that are prone to seasonal famines⁸. When agricultural workers from landless households are offered US \$11.50 for the round-trip bus fare, many migrate to cities in search of work and, as a consequence, their families consume the equivalent of one additional meal per day during the pre-harvest lean season. Moreover, many of them choose to migrate during lean seasons in subsequent years, even absent any further incentive. Seasonal migration proves to be very profitable on average, which is reminiscent of the puzzle we raised at the outset: why were people not already engaging in this highly profitable behaviour? At least part of the answer appears to be risk aversion. Even though migration is profitable for most, there is a roughly 20% risk of failure to find work, which threatens to put households with low incomes at risk of falling below subsistence, and is sufficient to deter investment. The free bus ticket offered by the project acts as insurance against that dreaded outcome.

The most direct remedy for risk aversion is insurance. In this, social networks may again have a critical role. The extent of informal 'risk sharing' in the community can either permit or deter migration and, conversely, the gains generated by migration in Bangladesh are shared and provide informal insurance to others in the community⁹. In the absence of formal insurance markets in developing countries, informal risk-sharing is a common way for people to manage risk, but that (necessary) institution may itself lower the demand for formal insurance¹⁰. Formal insurance is yet another example of a product for which we

see surprisingly low take-up, where farmers often choose not to insure their crops or livestock¹¹.

Social norms as barriers to behaviour change. Social and systemic influences are powerful: wealth inequalities, stress, social exclusion or support, cultural beliefs and food preferences, and access to health systems may all influence health outcomes over and above the individual-level factors discussed above. These social factors may explain why outcomes are so starkly different for different populations even within wealthy countries¹². Social networks, as we have seen, can have a supportive role: accelerating useful learning and increasing resilience through insurance for uncertain, and therefore stressful, decisions. Conversely, social norms can also inhibit behaviour change. For example, it may be much more difficult to get Indian individuals in rural communities to invest in improved sanitation practices, if open defecation is the socially accepted practice and there is no societal penalty for engaging in the behaviour that undermines public health. Studies in Bangladesh show that each rural household becomes more likely to convert a 50% subsidy voucher into an actual toilet investment if a larger proportion of their neighbours are simultaneously offered the same opportunity to invest¹³. In fact, for sanitation, even having neighbours make a public commitment in front of each other leads to sustained investments in improved sanitation¹⁴.

In analysing all these cases of low adoption of 'apparently beneficial' technologies, we should always entertain the possibility that the product is in fact not as attractive to users as it may seem at the outset. For example, unobserved disutility associated with the act of migration (for example, family separation or the poor living conditions in urban slums) makes that same Bangladesh migration intervention much less profitable than what increases in income and consumption would have us believe¹⁵. In the case of cleaner-burning stoves, users may dislike the changes in the taste of the food or the inconvenience of stoves that are not as easy to fix locally, even if it is healthier than the traditional cooking option.

However, although behaviour is stubbornly difficult to change, we cannot shy away from this challenge given the potential for enormous welfare gains.

Sustaining behaviour change

Well-designed field trials have generated actionable insights on how to encourage behaviour change that go beyond simple

communication and awareness programmes. To leverage the value from these trials, we call on researchers and policymakers to create durable institutional partnerships to iteratively design, test and scale solutions in context. For policymakers, this means shifting mindsets from ‘information generation’ to ‘behaviour change’. This is not merely a semantic change: budgets, systems and processes will need to be relooked. As a simple example, communication budgets in government departments often sit separately from programme budgets, but behaviour change may require an integrated mix of information, social network-based strategies and targeted subsidies. By designing partnerships specifically around behaviour-change interventions rather than functional silos, partners can take an integrated view of solutions. Such partnerships will necessarily need to design performance structures that do not penalize the failures that are an inevitable part of experimentation and learning.

Finally, institution-building will need to be decentralized, so that individual government ministries can move quickly to partner with researchers who have relevant sectoral expertise.

COVID-19 has taught us that we cannot wait for a pandemic to think about behaviour change. A billion people every day are in similar states of emergency, given poor living standards, health and sanitation. We need to invest in sustainable, evidence-informed behaviour change now.

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Competing interests

The authors declare no competing interests.