Simulations for Equity in Education (SEE)

According to estimates from UNESCO’s Institute for Statistics, 57 million children worldwide remain out of school today. Millions more are in schools where they are not learning, and with high risks of dropping out early. The majority of these children suffer from various forms of disadvantage. In order to achieve education and learning for all, developing countries need to implement targeted policies to reach out-of-school children and to improve learning outcomes for those in school. But how is this to be done? Which types of interventions do impact evaluations indicate are the most promising, how much do they cost, and what is their likely impact depending on country circumstances? Moreover, can interventions targeted at the poor and marginalized also be cost-effective? The Simulations for Equity in Education (SEE) project aims to provide answers to these questions.
The SEE project is a collaboration between UNICEF and the World Bank to identify cost-effective strategies for reaching children who are excluded from or underserved by education systems. SEE is intended to help countries identify cost-effective, pro-equity education strategies, and to serve as a global tool for developing evidence-based documentation of and advocacy for such strategies. SEE projects costs of interventions to reach different groups of excluded children and improvements in school outcomes as a result of these interventions. A database on the effectiveness of education interventions around the world has also been developed.

The most significant intended use is with the Ministry of Education and local development partners in the context of Education Sector Plan (ESP) preparation, monitoring and a policy dialogue that encompasses a rights-based approach to establishing orientation and priorities. Other uses of the SEE model can be, for example, to support UNICEF's programming in the education sector.

About the SEE model

The SEE model can be used to compare potential improvements in school outcomes for different groups of excluded children as a result of different intervention packages, as well as the costs thereof. SEE uses a lifecycle approach. This means that school entry, retention, repetition and learning are all simulated explicitly for different risk groups. The user can define an intervention package using a list of up to 30 interventions, and can target the interventions to particular risk groups. The model then computes the changes in school entry, retention, repetition and learning resulting from the interventions. The impacts of the interventions are determined by the context of the country itself as well as inherent effectiveness (found in the database). It is easy to define multiple intervention packages and compare the outcomes and costs. The model is built in Excel with an intuitive, accessible interface and an adaptable structure, so that it may be used in different countries. SEE can also be adapted for preschool and secondary education. Figure 1 illustrates how the ‘risk groups’ of marginalized children and the proposed interventions feed into computations that lead to model output and results.

SEE represents a significant departure from traditional education projection methodologies in that 1) it can treat multiple risk groups in the population separately, and 2) outcomes are determined by interventions.

The SEE project began in August 2011 and includes the World Bank and UNICEF compiling a database of evidence on the effectiveness of interventions that would be key to the model’s workings.

SEE pilot results from Ghana

The Ghana pilot project in May 2012 included input from the Ghana Ministry of Education and the United Kingdom Department for International Development (DFID), continual feedback from UNICEF Ghana, from the WCARO Regional Office, and feedback from an expert group gathered in Accra for a SEE training workshop in May 2012.

The values for intervention effectiveness in the Ghana pilot were estimated using the database on the effectiveness of interventions that includes more than 300 studies. As for any estimate, and in particular those computed by using other countries’ data, some uncertainty remains. To deal with this uncertainty, the SEE model allows users to complete a sensitivity analysis that estimates change of findings according to changes in input and assumption data.

Initial results from simulations based on the Ghana pilot show that a pro-equity approach to education can be significantly more cost-effective than a non-targeted approach.
Two sets of interventions are described here: increasing kindergartens and providing better teachers.

1. **Kindergartens can have a greater overall impact if they are targeted to poor, marginalized children.**

Three kindergarten scenarios were compared for Ghana, each with the same cost of US$10 million but with successively more specified targeting:

1. Build and run 500 kindergartens, spread evenly throughout the country to districts without kindergartens.
2. Build and run 500 kindergartens in the poorer, more remote northern area of the country to districts without kindergartens.
3. Build and run 500 kindergartens in the poorest villages within the northern regions.

The model computed improved schooling as a result of the enhanced school-readiness provided through kindergartens. An important outcome was that many additional children would complete primary school, as shown in Figure 2. In the first scenario where kindergartens are spread evenly throughout the country, many will be built in districts where school retention rates are already relatively high – and there is little scope to improve retention and completion. In this scenario, the additional number of completers is only a bit more over 2,000. Focusing the kindergartens in the northern regions (scenario 2) raises that number to 8,000. Third, even better targeting to reach the poorest villages – those with the highest dropout rates and the greatest potential for improvement – can raise the number of new completers to 11,000. Commensurately, the average ‘cost per additional child completing’ is far lower in the targeted scenario, and the difference is quite large – a more than fourfold improvement.

2. **Equity programmes can be more effective and less expensive than a business-as-usual approach.**

This result is shown in two teacher scenarios for Ghana. As in many other countries, there is a shortage of trained teachers in Ghana – 35 per cent of teachers are not certified. In Ghana’s Education Sector Plan, the policy is to greatly increase the proportion of trained teachers. This official policy was compared to an alternative, pro-equity strategy for teachers just in the northern regions and with a focus on providing remedial teachers for the poorest learners, while providing in-service training to the existing uncertified teachers. The alternative strategy would lead to **more** children reaching the National Education Assessment (NEA) math standards by 2020, and cost about 20 per cent **less**, as shown in Table 1.

The basic insights are that: (a) potential gains are greatest among children who are doing poorly, and (b) even relatively low-cost interventions can help those children. It is expected that the application of the SEE model in other countries will identify other pro-equity strategies that are more cost-effective than business as usual.

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**Figure 2 Additional number of children to complete primary school as a result of building 500 kindergartens (Ks) in Ghana, 2012–2020, and average cost per additional completer**

![Figure 2](image-url)
3. Context significantly affects the impact of interventions.

The outcomes of the scenarios are significantly affected by external circumstances, or context. For example, kindergartens tend to be more effective if the initial conditions are worse (e.g. entry and retention rates are lower; poverty is more widespread). Figure 3 shows the percentage point change in dropout rates found in 8 studies for children who went to preschool compared to those control groups who did not, cross-tabulated by the initial dropout rates.\(^1\) Clearly, the figure shows there is a positive relation between the intervention’s impact and the initial scope of the problem (dropout). Similarly, intervention impacts tend to be larger when the group of marginalized children they can help is larger. For example, the impact of income support programs is greater in communities where poverty is more widespread or deeper, and de-worming to reduce absenteeism and improve nutrition is more effective in contexts where worms are a greater health issue.

The patterns of education bottlenecks and inequity vary quite widely across countries, and these differences in context will make interventions that are effective in one place completely ineffective in another. It will be one of this project’s goals during 2013 to build country-specific knowledge and estimates about interventions’ impacts and consequently strengthen the statistical robustness of the model when applied to different contexts.

### Table 1 Two teacher scenarios for Ghana, 2012-2020: A business-as-usual upgrade compared to a pro-equity approach

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Business as usual: Replace 20,000 untrained teachers with pre-service trained teachers</th>
<th>Equity focus for teachers: Provide in-service training for 12,000 teachers in marginalized areas and 8,000 remedial teachers for vulnerable children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>US$206 million</td>
<td>US$153 million</td>
</tr>
<tr>
<td>Additional children to pass NEA math standards</td>
<td>61,000</td>
<td>87,000</td>
</tr>
</tbody>
</table>

### Next steps

In the coming years, SEE will be piloted in more countries, with a focus on training sessions and strengthening national capacity of ministries of education in education system analysis and data quality control. We anticipate that the combined experience from these countries and contexts will expand and strengthen the early findings. And it is hoped that building capacity in education system analysis and implementing SEE will improve decision-making and dialogue within countries, and lead to more cost-effective pro-equity programmes for children who have previously been marginalized.

### Figure 3 Impact of kindergarten on dropout rates in different contexts.

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% point drop-out reduction

% = Percentage

0 5 10 15 20 25 30
0 10 20 30 40 50 60 70 80
Starting dropout rate
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### Contact

If you are interested in learning more about the Simulations for Equity in Education project, contact Mathieu Brossard (mbrossard@unicef.org) or Jordan Naidoo (jnaidoo@unicef.org) at the UNICEF Education Section in New York, or Quentin Wodon (qwodon@worldbank.org) at the World Bank Human Development Department.

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\(^1\) Figure from UNICEF and World Bank, 2013, Simulations for Equity in Education (SEE): Background, methodology and pilot results