Bolivia:
costs and benefits

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The PIDI Programme

The PIDI early childhood development programme consists of non-formal, home-based daycare centres where children receive nutrition, health and cognitive development services. Each centre serves 15 children, ranging from six months to six years of age. There is one mother/caretaker, who is assisted by one or two helpers, depending on the number of children under two in the PIDI. Children receive food that provides 70 percent of their calorie requirements, and basic healthcare. They are immunised, weighed and measured; and go through a daily programme of games and age-specific exercises to stimulate their cognitive development.

They are from very poor households in peri-urban areas, many being recent migrants from rural areas. Social conditions are characterised by high levels of malnutrition, infant and child mortality and disease, and by stunted psycho-social development. Primary school enrolment is very low. Repetition rates and drop-out rates are high. There is virtually no progression to higher levels of education.

The programme's objectives are:

1. to improve children's readiness to succeed in school and beyond by facilitating their physical, emotional, social and cognitive development;

2. to enhance the status of women by increasing their employment opportunities, and to expand their knowledge of health, education, and nutrition; and

3. to increase community and private sector participation in the social development process.

Direct benefits from service delivery

ECD programmes provide a number of services that directly benefit the

enrolled child and her family. They include: meals and healthcare, and childcare services. Additional direct benefits may include training the mothers (for example on a child's nutritional needs), which may be valued by these mothers for its own sake.
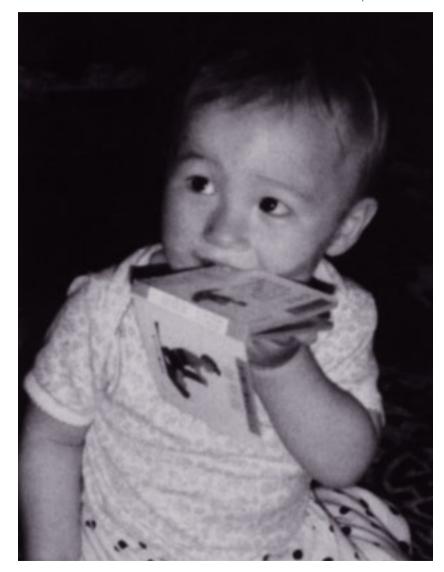
In general, it is not difficult to measure the value of the direct benefits. The value of the food benefit can be estimated as its market value. If healthcare services are provided, the cost of these services in, say, a clinic can provide an estimate of its value to the recipient. In the same way all other services that are provided directly to the child or her mother or parents can be included in the analysis.[1]

If we restrict ourselves to the value of the two meals per day that PIDI children receive, the direct benefits would amount to USD 150 (about half of total service delivery costs[2]). Alternatively, we could use the total recurrent costs of the programme[3] as a proxy for the service delivery benefits to the children and their families. This would put the direct service delivery benefits at about USD 300 per child per year.

Preparing the base-line data for the productivity analysis

This part of the analysis involves the benefits in the form of increased productivity resulting from more education. Therefore, we first need to characterise the Bolivian education system. There are four levels of formal education in Bolivia, from primary schooling to higher education, each of which requires a number of years to complete, and each year has a unit cost. For performance indicators we chose enrolment and repetition rates by level of schooling. Our data show that Bolivia has a long way to go before the education of the population reaches levels sufficient to compete successfully in an increasingly knowledge-based and competitive global economy.

Using data from a 1993 integrated household survey covering a representative sample of urban households, we estimated a wage equation that related differences in (the logarithm of) wages, to differences in education levels and years of experience. Our results imply that someone who completed primary education earns 42 percent more

(is 42 percent more productive) than someone without schooling. Since primary school has five grades, this amounts to a modest 8 percent increase in wages per year of education. We also find that a college graduate earns on average 2.76 times as much as an unschooled wage-earner. The estimation results on experience imply that wages peak after about 35 years of experience.

Armed with this information, we can now quantify the benefits of ECD programmes that are manifested in increased productivity.

The impact of the PIDI Programme on social development

The first programme effect we look at is increased survival. Once a child is born she will grow up to become a productive member of society. The level of her productivity will depend on her physical and cognitive development during the early years of life, as well as on the investment in basic and higher education, and on subsequent investments in human capital, through continued learning and experience.

If the child dies prematurely, her future productivity, whatever its level, is lost for society. Preliminary results from the PIDI Programme suggest that the mortality of those enrolled is extremely low, less than one percent. This contrasts with the high child mortality rate – about 20 percent – of the target population in the absence of the ECD intervention. Once children are enrolled in a safe environment where life-threatening diseases (diarrhoea, severe malnutrition) are recognised and treated in time, children six months old or older have virtually a 100 percent chance to survive past the age of five.

Reliable information on changes in the nutritional status of enrolled children is not yet available. Possible changes in chronic malnutrition (stunting) may not be evident for years (they may not occur until the children reach puberty). Estimates on the programme's effect on acute malnutrition (wasting) also await future evaluation efforts.

Forty percent of children who initially enrol in the PIDI Programme show stunted psycho-social development.

After one year in the programme this percentage is reduced to 20 percent. After two years it is cut to five percent.[4] If this result of tremendous progress in psycho-social development holds up under further scrutiny, it bodes well for the future chances of successfully educating PIDI graduates.

Before we can translate these results into monetary benefits, using the standard economics of education approach explained in *The benefits of ECD programmes: an economic analysis,* we need to translate these effects on nutritional status and cognitive development into expected changes in enrolment, drop out rates, repetition rates, and progression to higher levels of education. We are fortunate to have direct observations of changes in primary enrolment, but we have to turn to the literature (or to data on the general population) to obtain estimates for improvements in school performance.

Though the PIDI Programme is still young, the limited information available suggests that virtually all children who leave the programme at the age of six enrol in primary school, up from 20 percent in the absence of the programme. Part of this large increase is probably the direct result of the improvements in the children's health and nutrition levels. Part, no doubt, also stems from parents' greater awareness of the benefits of education – a result of the parents' active participation in the programme.

Given favourable outcomes on nutrition and school preparedness (or psycho-social development), one would expect improvements in school performance, which are reflected in reduced drop-out and repetition rates and increased progression to higher levels of education. Due to lack of more detailed information, we will assume that PIDI graduates, once they are enrolled in primary school, will perform at the same level as the national average.

We worked with the relevant social indicators of two target groups, with and without the PIDI Programme (Scenario One and Scenario Two). Scenario One can be thought of as the result of a very narrow targeting effort that reaches the most deprived segments of society. Scenario Two represents a part of society which already enjoys modestly favourable social indicators. The effects of the ECD intervention are therefore less dramatic than in the first scenario. We assume that the infant mortality rate and the primary enrolment rate can be improved to the national averages while progression to higher levels of schooling improves modestly. Results from both scenarios will give us a range for the cost-benefit ratios. We also assume that drop-out and repetition rates in primary school will be reduced by 50 percent.

The US Dollar value of increased productivity

We first estimate the net present value (NPV) of the education system as it currently functions for the target group (20 percent primary enrolment, 35 percent drop-out, 10 percent repetition, and no progression to higher levels of education). The 20 percent of children who do enrol have a higher level of productivity during their active lifetime than they would have had without this education. We use the age-earnings function to estimate this increase in productivity. We calculate the present value of this increase by discounting it at an annual rate of seven percent. After subtracting the cost of education, we obtain the net present value of the current education system. For a cohort of 1,000 children in the target population, the current education system increases lifetime productivity by USD 264,517. These are society's profits from investing in the human capital of just 20 percent of 1,000 children in the target group – the net cost of education. This relatively high number is, of course, a direct reflection of the economic returns to primary education that were estimated from the wage-earnings function.

Next we reduce the under-five mortality from 200 to 10 per 1,000. This adds 190 productive people to the cohort, of whom 20 percent will increase their basic productivity by enrolling in primary education. This raises the net present value of the education system from USD 264,517 to USD 327,340. In other words, we could invest (USD 327,340 – USD 264,517) = USD 62,823 per

1000 high-risk children, just to increase their survival rates, and still break even. Given the relatively cheap measures that are available to prevent the premature death of a child (for example, a dose of oral rehydration therapy costs about two dollars) survival appears to be a good economic deal, on the sole basis of future productive contributions to society.

Increase in Net Present Value of productivity due to improved social indicators

Our study shows that, for Scenario One, enrolment in primary school increased from 20 percent to 95 percent. Even without taking into account increased survival, the net present value of this benefit (without increased survival and measured only by the increased productivity of the cohort) would amount to USD 1,256,458. We were also able to determine the combined impact of the programme on the lifetime productivity of 1,000 children in the target group. We did this by first combining the programme's impact on survival and enrolment; then adding a reduction in drop-out and repetition

rates; and then increasing progression rates for the target group to post-primary levels of education, from zero to the national averages. Under these assumptions, the combined impact of the programme has a net present value of USD 3,160,533.

A programme for preschool children that costs USD 3,160 per child, and that produces changes in the under-five mortality rate and in education indicators (in psycho-social development, and progress and performance in primary schools), would pay for itself in terms of higher lifetime productivity of the participants.

If a child enrols for four years in such a programme, at USD 350 per year, for a total cost of USD 1400, the cost-benefit ratio of the programme, on the basis of this benefit alone, would be 2.07. In other words, the net present value of the productivity related benefits of the PIDI Programme, exceeds the initial investment by 126 percent. Scenario Two produces a cost-benefit ratio of 1.38.

Benefits other than increased productivity

Thus far, we have looked only at direct programme benefits and benefits that emerge through increased education. Among the latter, we looked at the effect of education on future productivity only. In this section we will look at one additional benefit that results from improved education: reduced future fertility.

We assume that because of the ECD programme, girls will enjoy six years education, instead of not enrolling in school at all. As a result of this, fertility could drop by 30 to 60 percent.[5] Using the lower bound, and a current fertility rate of nine in the target group, the ECD programme could reduce the expected number of births in a group of 1,000 ECD participants (500 girls), from 4,500 (fertility rate is nine), to 3000 (fertility rate is six).

The alternative costs of one birth averted is USD 250. The economic benefits of the ECD programme, as a result of reduced fertility, amounts to 1500 x USD 250 = USD 375,000 for 1,000 children enrolled

in the programme. Since these benefits are savings on population programmes that would have to be implemented about 10 years in the future, the discounted value of this benefit amounts to USD 190,630 or USD 190 per enrolled child. It may seem contradictory to count both a death averted (reduced infant mortality rate) and a birth averted as programme benefits, but it is not. Under certain conditions, a reduction in fertility bestows benefits on society that go beyond the benefits in terms of improved mother's health or improved quality of life for the (fewer) children in the family. At the same time, once a child is born, it is beneficial for society to help her grow up and become a productive citizen. Both the increased levels of productivity and the lower number of births are benefits that result from ECD programmes.

Calculating the cost-benefit ratio of the PIDI Programme

On the basis of the results presented in our full study, we are now able to calculate cost-benefit ratios for the Bolivian PIDI Programme. We use the productivity gains as discussed for

Scenarios One and Two. We add the benefits (to the family) of direct services, as well as the benefits to society of reduced future fertility. We are unable to quantify all benefits. We use USD 350 as the total annual cost of enrolment in the ECD programme, and assume that children enrol for four years, for a total cost of USD 1400. The cost/benefit ratio of the PIDI Programme lies between 2.38 and 3.06, making it clear that the value of the investment in the PIDI Programme compares favourably with the so-called 'hard' sectors.

Conclusions

Investments in the health and nutritional status of young children, and in their cognitive development, have multiple benefits. They range from the direct reduction in the number of children who suffer from ill health, to enjoying more productive lives as adults; to improving society by, for example, reducing crime rates.

In our full paper we have tried to list all benefits of ECD programmes in a systematic way and quantify them in USD terms where feasible.

In general, ECD programmes are expensive. Moreover, ECD investments trigger further investments in human capital, thus increasing the total cost of the programme. We have compared the quantifiable benefits of one ECD programme, PIDI, with its costs, and obtained cost-benefit ratios between 2.38 and 3.06. This ratio is highest for interventions that target population groups whose social indicators show severe deprivation (for example, high infant mortality rates, high malnutrition rates, low school enrolment, poor school performance, and so on).

The combined impact of integrated ECD programmes result in a large increase in the accumulation of human capital. Because of this, ECD programmes as an investment compare favourably in terms of economic rate of return alone, with investments in the so-called 'hard' sectors.

Whether governments should invest in ECD is a different question. The answer depends in part on one's assessment of the societal benefits (the externalities) of ECD and in part on one's definition of what constitutes a just society. The

externality arguments in favour of public financing, are very similar to those for education in general.

We argue in the full paper that a strong case in favour of public financing (or subsidising) of ECD programmes can be made on the basis of a minimalistic sense of 'societal justice'. ECD programmes are likely to be most beneficial for children who grow up in the poorest households – the same households that cannot afford to pay for ECD services. This suggests that well-targeted public programmes can maximise society's benefits from ECD interventions while remaining affordable. Since a large part of the benefits of ECD are private benefits, it seems reasonable to expect better-off parents to contribute to the cost of this investment in the future of their children.

Societies cannot prosper if their children suffer. ECD programmes are a sound investment in the well-being of children and in the future of societies. By breaking the inter-generational cycle of deprivation, ECD programmes are a powerful tool to obtain the ultimate

objective of development: to give all people a chance to live productive and fulfilling lives.   ○

notes

1. Schweinhart *et al* use the cost of childcare as an estimate for the 'baby-sitting' services of the preschool programme. Schweinhart LJ, Barnes HV and Weikart DP, *Significant benefits: the High/Scope Perry Pre-school study through age 27;* (1993) Ypsilanti, Michigan High/Scope Press.

2. See Ruiz F and Giussani J, *Estudio de costos del projecto integral de desarrollo infantil (PIDI);* (1997) UDAPSO, La Paz.

3. Net of overhead costs such as administration and evaluation.

4. Clemente RC, *Desarrollo psicosocial en menores a cinco años de edad;* (1996) UDAPSO, La Paz.

5. Throughout this example we use data from Summers LH, *Investing in all people: education of women in developing countries – Economic Development Institute Seminar Paper 45;* (1994) World Bank, Washington DC.