My Analysis of
"Benefit-Cost Analysis of a Package of Early Childhood Interventions to Improve Nutrition in Haiti"

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Initial Setup

- Research article written by Brad Wong and Mark Radin in 2019 to address a package of ten health interventions in Haiti

- Generalized the results of a previous study to understand if it would work well to improve the health of children in Haiti

- Many of these interventions target the health of children and pregnant women

- The study is performed from the perspective of a Haitian policymaker

  - Costs are given in dollar amounts and in Haitian Gourdes

- Haiti is known for having had natural disasters that have left them worse off than others

Setup (Continued)

- The authors use a scaling program, called LiST (Lives Saved Tool)
  - The Lives Saved Tool allows different interventions to be scaled in lower income countries for the purpose of analyzing the effect
  - The authors want to analyze the costs and benefits if 90% of the population is targeted
- It is mentioned by the authors early on that the purpose of the paper is to identify if the package of health interventions is worth the cost, and not necessarily to compare to other analyses of different packages
- Analysis is calculated from 2016 to 2025
- Discount rates are set at 3%, 5%, and12%
- Costs and benefits are given in years
- For the main calculation, a "base case" is used, and 10,000 monte carlo simulations are run afterwards in order to better assess where the benefits of the analysis would fall with the allowance of uncertainty

Interventions

- Most of the interventions, besides 5, 6, and 10 go to the mothers.

- Package was taken from a study called *Evidence – Based Interventions for Improvement of Maternal and Child Nutrition: What can be Done and at What Cost?* (Bhutta et al. 2003)

- The original study looked at these ten interventions and suggested that they could be scaled up to reach 90% of the population of lower and middle income countries

- Radin and Wong took this and applied it to Haiti

Number	Intervention
1	Iodization of salt
2	Micronutrient supplements for pregnant women
3	Calcium supplements for pregnant women
4	Protein supplements for pregnant women
5	Vitamin A supplements for six to fifty – nine – month – old children
6	Zinc supplements for twelve to fifty – nine – month – old children
7	The promotion of breastfeeding (helps newborn to six – month – old children)
8	Feeding education (helps six twenty – three – month – old children)
9	Food supplements for six to twenty – three – month – old children
10	Management of severe acute malnutrition for six to twenty – three – month – old – children, as needed

Costs

- Can be sorted into three main categories, though they are calculated together:
  - Cost of the intervention scaled to 90%
  - Cost of workers to distribute the package (a function of the discount rate)
  - Cost of travel to reach 90%
- Supply, storage, and packaging costs were also taken into account
- The cost of most of these interventions were given by previous research articles, especially Haiti Priorise, a group of researchers aiming to benefit the health of Haiti
- Only the cost of these interventions are given by the other papers (they are each scaled to 90%, though they were not at 90% in their original papers):
  - The iodization of salt
  - Micronutrient supplements for pregnant women
  - Calcium supplements for pregnant women
  - Vitamin A supplements for children
  - Severe Acute Malnutrition help

Costs (continued)

- All other interventions are scaled based on their relation to these interventions, creating an approximate estimation of the annual cost

Number	Intervention	Annual Cost
1	Iodization of salt	0.5 million gourdes
2	Micronutrient supplements for pregnant women	746 million gourdes
3	Calcium supplements for pregnant women	(Calculated with 2)
4	Protein supplements for pregnant women	745 million gourdes
5	Vitamin A supplements for six to fifty – nine – month – old children	39 million gourdes
6	Zinc supplements for twelve to fifty – nine – month – old children	121 million gourdes
7	The promotion of breastfeeding (helps newborn to six – month – old children)	253 million gourdes
8	Feeding education (helps six twenty – three – month – old children)	106 million gourdes
9	Food supplements for six to twenty – three – month – old children	1,005 million gourdes
10	Management of severe acute malnutrition for six to twenty – three – month – old – children, as needed	4.3 million gourdes
Altogether,		3,019 million gourdes

	3% Discount Rate	5% Discount Rate	12% Discount Rate
Annual Aggregate Costs:	3,182 million gourdes	3,178 million gourdes	3,166 million gourdes

Benefits

	3% Discount Rate	5% Discount Rate	12% Discount Rate
Annual Death Avoided	3,129 million gourdes	3,101 million gourdes	3,009 million gourdes
Health Risks Avoided	709 million gourdes	707 million gourdes	700 million gourdes
Annual Productivity Gained	23,025 million gourdes	12,743 million gourdes	2,525 million gourdes
Aggregate Benefits	26,593 million gourdes	16,294 million gourdes	6,019 million gourdes

- Authors generalize this into three categories
  - Cost of deaths that have been avoided (value of a statistical life)
  - Cost of injury or health risks avoided
  - Total productivity gained by implementation of the interventions
- The value of a statistical life is calculated using the gross national income
  - For this reason, it changes based on the year (given above)
- The health risks avoided is calculated from another study in which the willingness to pay to avoid diarrhea is calculated

Benefits (continued)

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Annual Death Avoided	3,129 million gourdes	3,101 million gourdes	3,009 million gourdes
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- Annual Productivity gained is calculated from studies that look at the impact of stunted growth on wages
  - Generalizing this, the authors take the labor force participation rate and assume that the average working age will be from 16 to 60, and wages will change based on inflation

Net Benefits and Authors' Conclusions

	3% Discount Rate	5% Discount Rate	12% Discount Rate
Annual Aggregate Costs:	3,182 million gourdes	3,178 million gourdes	3,166 million gourdes
Annual Aggregate Benefits:	26,593 million gourdes	16,294 million gourdes	6,019 million gourdes
Annual Net:	23,680 million gourdes	13,372 million gourdes	3,068 million gourdes

➥ While the point of the study was not to get a single value that would act as a comparison tool against other analyses, the authors suggest that this may not be the best package to implement in spite of its positive net benefits

10,000 Monte Carlo Simulations

- The authors then generalized this study by running 10,000 monte carlo simulations, putting uncertain values on a distribution and allowing them to change with each simulation

- The calculation for the value of a statistical life, the willingness to pay that people show to avoid diarrhea, the productivity gained from the interventions, the short, medium, and long term growth rate, the discount rate, and the cost of each of the interventions were allowed to deviate based on the low and high values given from previous studies

- The effects of the interventions themselves were placed on normal distributions

- These Monte Carlo simulations gave:
  - Low: 1.3 million gourdes
  - Average: 8.6 million gourdes
  - High: 44.6 million gourdes

Strengths of this Study

- One strength from this study is shown when the author considers that travel costs will increase as more people are reached
  - The costs are thus adjusted based on a previous paper that analyzed this issue

- 10,000 Monte Carlo simulations are run in order to take uncertainty into account.
  - This corrects for a lot of uncertainty, and the fact that the author's get all positive values from the simulations lends a lot of credibility to the study

Weaknesses of this Study

- One large weakness of this study stems from the fact that the LiST program does not take localized effects into account
  - This creates a sort of rationality assumption, in which people are assumed to accept the interventions regardless of the way in which they live or psychological or cultural biases against the intervention variable
  - Since so many of the interventions and effects are scaled, and each is scaled to such a high degree, this method leaves some room for doubt
  - For this reason, 90% of the population may be an unachievable goal, and thus, the benefits are overstated

- Much of the methods are taken from other literature or provided by mathematical and statistical modeling.
  - It can be difficult to know if the paper does not suffer from an aggregated assumption issue
  - It can also be difficult to see if many geographic or other such factors have been taken into account
  - Many of the authors' calculations, such as the calculation of the social discount rate, sound as though the author is taking the opinions of other researchers
  - Not all of the assumptions made within the studies may be directly applicable to this study

Bibliography

- Bhutta, Zulfiqar A., Jai K. Das, Arjumand Rizvi, Michelle F. Gaffey, Neff Walker, Susan Horton, Patrick Webb, Anna Lartey, and Robert E. Black. 2013. "Evidence – Based Interventions for Improvement of Maternal and Child Nutrition: What can be Done and at What Cost?" *The Lancet* 382(9890), 452 – 477.

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