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ECONOMIC EVALUATION OF PREVENTIVE HEALTHCARE: A COST BENEFIT ANALYSIS OF A PARENTING PROGRAM

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Abstract

The positive impact of parenting programs on the health and wellbeing of individuals and their immediate community has been confirmed in many studies. Often, and especially during the Covid-19 pandemics, prevention health programs are stalled due to other policy priorities. Cost-benefit analysis (CBA) can be used for the economic evaluation of public health programs to support evidence-based health policies and allows the comparison of the monetized effects of programs across different societal domains. However, CBA requires a variety of data that are typically difficult to obtain. Using the Incredible Years (IY) parenting program case, we illustrate how CBA can be practically applied. For parenting programs, the positive effects arise exclusively in non-monetary form as benefits arising from avoiding adverse effects in society. We show how to monetize them by estimating the avoided costs of healthcare, educational, and other societal costs due to the program's implementation. At a 4% social discount rate, the economic net present value is positive and high, showing that the present value of the program's benefits exceeds the costs of the program by almost €800 thousand. The benefit-to-cost index of 5.6 confirms that every € invested in the program brings benefits of €5.6 in monetary terms. Cost-benefit analysis provides a convincing foundation for distributing public funds as it allows for a comparison of field-related programs and programs from different fields. Consequently, they increase any public policy's effectiveness and efficiency, but especially preventive health policy.

Keywords: Economic Evaluation, Cost-Benefit Analysis, Parenting Programs, Incredible Years

1. Introduction

Extensive research confirms the positive impact of parenting programs on the health and wellbeing of individuals and their immediate community (O'Neill *et al.* 2010; Menting *et al.* 2013; Colman *et al.* 2009; Cleary *et al.* 2004; Furlong *et al.* 2018). Confidence in own parenting skills has been shown to significantly improve children's wellbeing, especially during more stressful times, such as the Covid 19 pandemic (Roos *et al.* 2021). At the same time, in these circumstances, prevention health programs are stalled due to other policy priorities. Cost-benefit analysis (CBA) can be used to evaluate the effects of public health programs to support evidence-based health policies. In addition, it allows a comparison of the monetized effects of programs across different societal domains. However, this type of analysis requires a variety of data that are typically difficult to obtain. Using the Incredible Years (IY) parenting program as an example, we show how the economic effects of such programs can be evaluated even when program outcomes are not systematically measured, which is often the case.

Economic evaluations of healthcare programs have become widely recognized as a vital part of such studies among academics and practitioners (Le *et al.* 2021). In line with new public economics, there is a clear need for performance evaluation of public programs based on quantification and monetization of programs' effects. Such evaluations provide a convincing foundation for distributing public funds as they allow for a comparison of field-related programs and programs from different fields, for example, between healthcare and education or healthcare and defense. Additionally, economic evaluations of health programs ensure health policy measures to increase its effectiveness and efficiency.

The comparison of costs and economic benefits of such programs has unfortunately not been studied frequently, primarily due to the complexity of the analysis as the program effects occur in various dimensions of people's lives. While measuring the costs of such programs in CBA is usually not problematic as they usually can be directly observed in monetary units, measuring and especially monetizing benefits of such programs poses a considerable challenge. An economic evaluation of IY or comparable parenting programs is most often founded on cost efficiency analysis (CEA), aiming to quantify but not monetizing program's effects and calculating a cost per unit of effect (O'Neill *et al.* 2010; Edwards *et al.* 2016; O'Neill *et al.* 2013; Stevens, 2014; Nystrand *et al.* 2019). There is a clear call for a more standardized approach of comparing parent programs' cost-effectiveness (Nystrand *et al.* 2019).

Our study is one of the few studies of IY or similar parenting programs (e.g., O'Neill *et al.* 2010; Reynolds *et al.* 2011; Herman *et al.* 2015) that methodologically draws on CBA. By combining professional and managerial experience from the IY program with an academic methodology to achieve a critical level of data-driven collaborative analysis, we contribute to the growing body of empirical evidence in this field. The analyzed case contributes to the practice of economic evaluations in the field of preventive health programs by demonstrating practical solutions to data collection. Compared to the more common CEA, CBA requires the monetization of program benefits. Our analysis captures monetized program benefits in the areas of primary and preschool education, health care, addiction, and juvenile delinquency. Other program benefits, including positive externalities of the program, are defined only qualitatively.

The next part of the paper focuses on the method, while in the third part, we present the results of the CBA, followed by the discussion and findings.

2. The cost-benefit analysis and parenting programs

Economic evaluation requires data on financial costs and the societal impact of the studied program or intervention. CBA is regarded as the most rigorous "umbrella" method as it requires both positive and negative effects to be expressed in money terms. Other methods, such as cost-utility analysis or CEA, have less rigorous requirements for monetizing the effects (Drummond *et al.* 2015). Regardless of the selected economic evaluation method, the program's effect should be measured based on the incremental principle (Sartori *et al.* 2014). That means that only incremental, i.e., additional costs and benefits, occurring due to the program that otherwise would not occur, should be evaluated.

We use the case of the IY program for parents of children between ages three to eight implemented in Slovenia in 2018. The program was introduced as a novelty in Slovenia, and there were no alternative programs with comparable context effects. Therefore, we treat the entire flow of the program's costs and benefits as incremental and arising due to the program's implementation. We study the program implemented in 2018 and observe its effects within a time horizon of ten years.

The identification and measurement of the effects of interventions is usually a demanding task in CBA, as it does not have any direct monetary benefits in terms of market revenues and rarely the effects can be directly measured in money terms. This is also the case for publicly funded parenting programs such as IY. The program's results in terms of its impact on the conduct and wellbeing of children and families are usually measured with standardized diagnostic questionnaires that participants fill in before and after implementation (e.g., the Parenting Scale, Eyberg Child Behavior Inventory (ECBI), Wellbeing Scale, DAWBA diagnostic interview). Other questionnaires, such as Client sociodemographic and service receipt inventory (Chisholm *et al.* 2000), can be used for measuring the program's effects related to social work, healthcare, and education requirements of the child and family members. Unfortunately, for the IY program in Slovenia, these effects have not been monitored systematically. To identify, measure, and monetize the benefits of the program, we use focus groups and expert opinions (Head of the Department for Child Psychiatry of the Division for Paediatrics in Ljubljana, the head of the IY programs in Slovenia, manager of the IY program), supplemented with secondary data, instead.

As this is a free public health program, it does not have any direct monetary benefits in terms of revenues. Thus, the program's positive effects arise exclusively in non-monetary form as benefits arising from non-occurrence of adverse effects in society. Such benefits are called opportunity benefits that arise from the avoided damages to society because of the program (Then *et al.* 2017). Because CBA is always performed from society's viewpoint, it also needs to include the program's externalities, external effects originating from uncompensated damages or benefits, incurred to third persons in society (Zerbe and Bellas, 2006). Thus, besides the program's direct effects on beneficiaries (i.e., children, parents, and other family members), the program's external effects on third persons need to be considered as well in CBA.

As mentioned, in CBA, all benefits and costs need to be stated in monetary terms. Different methods evolved to assess the non-monetary effects of programs, roughly classified into two large groups (Then *et al.* 2017). One group of the methods is based on the valuation of the effect through preferences of the individuals, either by assessing the willingness to pay or by assessing the willingness to accept. In both cases, the individual's preferences can be measured as revealed preferences or stated preferences (Johansson and Kristrom, 2018). The second group of methods is based on assessing savings in costs due to program effects or the assessment of additional costs imposed on society due to the program (Then *et al.* 2017). In this case, program effects are not assessed directly but in the form of opportunity benefits, i.e., costs that will not be incurred due to the program's implementation. In the case of opportunity benefits, cost savings can thus be measured directly based on savings in production costs when the latter is no longer required due to the effects of the program (e.g., costs of health services that are avoided, as the individual does not require medical treatment in a specific period; travel costs of individuals that are not incurred due to the implementation of the program). Costs are usually less challenging to identify and measure, as they typically come in monetary units (Johansson and Kristrom, 2018).

3. Data and methods

In this study, we consider that costs are incurred during the program's implementation, while benefits occur through a more extended period. Using the program's defined costs and benefits for the analyzed period, a cash flow projection is prepared, and economic viability indicators calculated. The costs and benefits occurring in different periods cannot be compared directly. However, we can compare them by calculating their present value based on the required social rate of return (Johansson and Kristrom, 2018), which reflects social time preferences. In the study,

we use a 4% discount rate required to evaluate investment projects funded by public funds in Slovenia (Republic of Slovenia, 2016).

The most commonly used indicators or methods for program evaluation are the economic net present value, the economic rate of return, and the benefit-cost ratio. Net present value (NPV) is a sum of present values of returns and investments (i.e., the sum of discounted cash flows) (Brigham and Ehrhardt, 2013). A positive NPV means that the program is economically viable, as its benefits exceed the investments and current program costs while also generating higher returns than the considered time preferences. The economic rate of return (ERR) is defined as the discount rate that makes the present value of returns equal to the present value of investments, i.e., a discount rate where NPV equals zero. The program is economically viable if the ERR is higher than the relevant discount rate (Brigham and Ehrhardt, 2013). The benefit-to-cost ratio (B/C ratio) is calculated as a ratio between the present value of benefits and the present value of investments. Accordingly, economically viable programs have a B/C greater than 1 (Sartori *et al.* 2014). This means that the present value of benefits exceeds the present value of investments and NPV is greater than zero.

4. Results

The study analyzes the IY parenting program costs for parents of children aged three to eight in Slovenia in 2018 and the benefits for ten years, i.e., 2019–2028. Based on focus group discussion and expert opinion (Manager of the IY program's, Head of the Department for Child Psychiatry of the Division for Pediatrics in Ljubljana and Head of the IY programs in Slovenia), we identify several fields where program effects are expected. However, we measure and later monetize only five fields with more pronounced fields due to data limitations. Figure 1 shows the dynamics of costs of the IY program implemented in 2018 and the anticipated benefits in the selected fields. While program implementation costs occurred immediately in 2018, the distribution and duration of anticipated benefits depend on field characteristics. The program's costs and studied benefits are discussed below.

Delinquency											●	**…**
Addiction											●	…
Healthcare		●	●	●	●	●	●	●	●	●	●	…
Primary education				●	●	●	●	●	●	●	●	…
Preschool education		●	●									
Cost	●											
Year	Program implementation	1	2	3	4	5	6	7	8	9	10	…

Figure 1. Fields and timing of the program's costs and the expected benefits
Notes: Focus group and expert interviews were used as data sources to prepare this figure.

4.1. Costs

Eligible costs of the IY parenting program in the 2018–2019 period amounted to €347,101, 95% of which was provided by the Ministry of Health of the Republic of Slovenia and the remaining 5% by the consortium of the program providers. Annually, the program was implemented in 15 groups with 12 participants on average, which is approximately 180 participants. Accordingly, the program's annual cost amounted to €173,551 and the cost per participant to €964. Compared to

the results of a meta-study (Furlong *et al.* 2012) reporting on €2,217 costs per family, the studied program costs are more than 50% lower in Slovenia.

4.2. Benefits

In terms of program benefits, we identified several fields where the program's effects occur. Still, we primarily measure and monetize only the most pronounced direct benefits in the fields of primary and preschool education, healthcare, addiction, and juvenile delinquency. The benefits' description, baseline assumptions about their size, and duration are presented in Table 1.

Table 1. Direct benefits of the IY program implementation according to the baseline assumptions

Field	Benefit source	Baseline assumption about the effect size	Duration of the effect on the observed 10-year period	Estimated annual benefit in €
Preschool education	Less APA[a] required	40% of participants' children	Immediately after program's implementation, two years, preschool period, age 4-5	2,047 € per child, 147,404€ total
Primary school education	Less APA[a] required	20% of participants' children	9 years, primary school period, age 6-14	2,943€ per child, 118,874€ total
Healthcare	Less medical services required, and less parents' absenteeism	50%[b] decrease in required medical services and absenteeism	10 years (and beyond)	522 € per child, 6,956€ total
Addiction	Less medical and social services required	1% of participants' children	1 year, age 14 (and beyond)	2,087€ per child, 4,052€ total
Juvenile delinquency	Less reformatory institutions' services required	0.5 % of participants' children	1 year, age 14 (and beyond)	31,800€ per child, 31,800€ total

Notes: [a] APA – additional professional assistance; [b] effect refers to 14% of participants' children that have already been involved in medical treatment due to behavioral and emotional issues during the time of programs' implementation

The assumptions about the effect sizes in each of the analyzed fields are based on reported experiences of the Centre for the Mental Health of Children and Adolescents that operate within Primary Healthcare Centre Celje (Centre for the Mental Health of Children and Adolescents, 2020) and the evidence-based projections for the Slovenian implementation of the IY program (Anderluh, 2017). As shown in Figure 1, the program brings immediate effects in healthcare and medical treatment for these children. This effect is generated throughout the observed period. Furthermore, immediately after the program's implementation, the program's opportunity benefits in the field of preschool education are evident. When the children of these parents start primary school, the benefits are transferred to that level. Throughout adolescence, the program leads to cost savings in treating juvenile addiction and reduces the need for residential treatment of juvenile delinquency. These savings are included in the analysis only in 2028, even though they also occur in later years.

Besides the quantified effects, there are other direct benefits and external effects of the program, which were not quantified and monetized in our analysis. These direct effects include a higher level of completed and attained education (O'Neill *et al.* 2010; Colman *et al.* 2009; Edwards *et al.* 2016; Leijten *et al.* 2018), better physical and mental health of children when they reach adulthood, a lower probability or shorter duration of unemployment (O'Neill *et al.* 2010). Consequently, the probability of economic independence increases, leading to fewer social aid

requirements and smaller costs of penal or reformatory institutions (Leijten *et al.* 2018; Kuhar and Zager Kocjan, 2020). Parenting programs also lead to effects on society as a whole. These external effects, i.e., uncompensated effects of the program on third parties, are also only qualitatively discussed. Improved welfare of children and families leads to healthy and responsible members of the society and consequently to improved welfare of society members. Less juvenile delinquency, addiction, and crime lead to greater safety levels of society (O'Neill *et al.* 2010).

4.3. Economic indicators

Table 2 shows the projection of cash flows associated with the costs and benefits of the 2018 IY program. With a 4% social discount rate, the economic net present value amounts to €795,553. The positive and high NPV shows that the IY parenting program is economically viable as the present value of the program's benefits exceeds its costs by almost 800 thousand €. The economic rate of return is 81%, which is well above the relevant social discount rate of 4%, while the B/C index is 5.58, meaning that the present value of benefits is more than 5 times higher compared to the program's costs, which is comparable to some other studies (Duncan *et al.* 2017).

Table 2. Cost, monetized benefits, and the results of economic evaluation

Year		Future value (€)	Present value (€)
Implementation cost 2018	0	-173,551	-173,551
Benefits 2019	1	154,359	148,422
Benefits 2020	2	139,239	128,734
Benefits 2021	3	125,830	111,862
Benefits 2022	4	118,270	101,098
Benefits 2023	5	118,270	97,209
Benefits 2024	6	118,270	93,470
Benefits 2025	7	118,270	89,875
Benefits 2026	8	118,270	86,419
Benefits 2027	9	118,270	83,095
Benefits 2028	10	42,808	28,920
Economic net present value (NPV)			**795,554**
Economic rate of return (ERR)			**81%**
Benefit to cost ratio (B/C)			**5.58**

As not all direct effects and none of the IY program's external effects were quantified and monetized, the benefits from Table 2 represent only one part of the actual positive effects. In contrast, the costs of the program's implementation are fully included. Due to this conservative approach in terms of benefit, we can thus argue that the program is even more economically viable than our economic indicators show. This result is also aligned with the findings of other studies (O'Neill *et al.* 2010; Menting *et al*. 2013; Reynolds *et al.* 2002; Duncan *et al.* 2017).

4.4. Sensitivity analysis

Projections of costs and benefits are typically constructed based on the assumptions about the size of the program's effects and the value of required inputs. Using the sensitivity analysis, we validate how much the CBA results depend on chosen assumptions. In column 2 of Table 3, we show the underlying assumptions on costs or the size of a particular program's effect. In columns 3 and 4, we alter the level of costs or studied effects to 50% higher or lower than in the original scenario. Columns 5 and 6 represent the corresponding NPVs, calculated for the altered assumptions but keeping all others at the baseline. Regardless of the direction of the change and the type of the effects, all calculated NPVs are positive, indicating the robust nature of CBA results for the IY program. The elasticity of NPV is calculated in column 7, showing that NPV is not

crucially influenced by any of the baseline assumptions regarding the sizes of the program's cost and effects. Namely, a 1% change of the program's effect in any of the studied fields changes NPV by less than 1%. Nevertheless, the NPV is most sensitive to the assumed effect in the field of primary education.

Table 3. Sensitivity analysis and calculation of critical values

Program costs and benefits	Underlying assumption	Interval from -50% to +50%		NPV interval (€)		Elasticity of NPV
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Costs (€)	173,551	86,775	260,326	882,329	708,778	0.14
Primary ed.	20%	10%	30%	483,339	1,107,767	0.73
Preschool ed.	40%	20%	60%	663,535	927,572	0.31
Healthcare	7%	4%	11%	767,344	823,763	0.07
Addiction	1%	1%	2%	794,185	796,922	0.01
Delinquency	0.56%	0.28%	0.83%	784,812	806,295	0.03

Using CBA for the economic evaluation of the parenting program IY implemented in 2018 in Slovenia proves the program's positive net economic effects on society. With a 4% social discount rate, the present value of primary education, preschool education, healthcare, addiction, and delinquency social benefits exceed the present value of costs of implementation of the program by more than five times, which is comparable to other similar programs (O'Neill *et al.* 2010; Menting *et al.* 2013).

5. Conclusion

The presented study is an example of economic evaluation that can represent a convincing decision-making foundation for distributing public funds on the one hand and for successfully competing for budget funds on the other. CBA analysis allows for a comparison of programs' economic results not only of field-related programs but also of programs from different fields, ensuring health policy becomes more efficient and effective.

Unlike in some other economic sectors such as the energetics and environmental sector, where a large body of benchmark CBA examples can be found, the presented analysis is one of the few economic evaluations of preventive health programs based on the CBA. The reason for the lack of such studies is the required monetization of both programs' costs and effects, as monetization is sometimes demanding or even ethically questionable. We believe our paper contributes to filling this gap by showing that benefits in preventive health programs can be estimated by monetizing the avoided damages (costs) in terms of services, public or private, which are no longer required because of the program's implementation.

Limitations of the presented study are mostly related to poor data availability. Most effects were identified and evaluated using qualitative research methods, which introduce some subjectivity in the data. To increase the quality of the presented and other economic evaluations of preventive health programs, in the future, more resources need to be invested to improve the quality and availability of data, i.e., predominantly longitudinal, about the programs' effects.

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