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Authors
Wang, May
Basurto-Davila, Ricardo
Nobari, Tabashir
et al.

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Economic Evaluation of California Prenatal Participation in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) to Prevent Preterm Birth

Roch A Nianogo, MD, MPH, PhD[1,2,*], **May C Wang, MA, MPH, DrPH**[2,3], **Ricardo Basurto-Davila, MSc, PhD**[4], **Tabashir Z Nobari, MPH, PhD**[2,3,5], **Michael Prelip, MPH, DPA**[3], **Onyebuchi A Arah, MD, MSc, DSc, MPH, PhD**[1,2,6], **Shannon E Whaley, PhD**[5]

[1]Department of Epidemiology, Fielding School of Public Health, University of California, Los Angeles (UCLA), 650 Charles E Young Dr S, Los Angeles, CA 90095

[2]California Center for Population Research, UCLA, Los Angeles, California, USA

[3]Department of Community Health Sciences, School of Public Health, University of California, Los Angeles, Los Angeles, CA, 650 Charles E Young Dr S, Los Angeles, CA 90095

[4]Chief Information Office, County of Los Angeles, Los Angeles, CA, USA

[5]Research and Evaluation Unit, Public Health Foundation Enterprises-Special Supplemental Nutrition Program for Women, Infants and Children (PHFE WIC), 12781 Schabarum Ave., Irwindale, CA 91706

[*]**Corresponding author:** Roch A. Nianogo, Department of Epidemiology, UCLA Fielding School of Public Health, 650 Charles E. Young Drive South, Los Angeles, CA 90095-1772, USA. niaroch@ucla.edu; Office phone: +1 310-265-5934.

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[6]UCLA Center for Health Policy Research, Los Angeles, California, USA

Abstract

There is growing evidence that prenatal participation in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) reduces the risk of adverse birth outcomes. With recent changes in health care, rising health care costs, and increasing rates of prematurity in the U.S., there is urgency to estimate the potential cost savings associated with prenatal WIC participation. A cost-benefit analysis from a societal perspective with a time horizon over the newborn's life course for a hypothetical cohort of 500,000 Californian pregnant women was conducted in 2017. A universal coverage, a status quo ('business as usual') and a reference scenario (absence of WIC) were compared. Total societal costs, incremental cost savings, return on investment, number of preterm births prevented, and incremental net monetary benefits were reported. WIC resulted in cost-savings of about $349 million and the prevention of 7,575 preterm births and would save more if it were universal. Spending $1 on prenatal WIC resulted in mean savings of $2.48 (range: $1.24 to $6.83). Decreasing prenatal WIC enrollment by 10% would incur additional costs (i.e. loss) of about $45.3 million to treat the resulting 981 preterm babies. In contrast, a 10% increase in prenatal WIC enrollment would prevent 141 preterm births and achieve additional cost-savings of $6.5 million. The findings confirm evaluations from the early 1990s that prenatal WIC participation is cost-saving and cost-effective. Further savings could be achieved if all eligible women were enrolled in WIC. Substantial preterm birth-related costs would result from reductions in WIC participation.

Keywords

cost-benefit; cost-effectiveness; economic evaluation; simulation; decision model; g-computation; preterm; WIC; birth outcomes; hypothetical cohort

INTRODUCTION

In the U.S., preterm birth (PTB; <37 weeks of gestation) accounts for one in eight births and is a leading cause of infant mortality.[1] Premature infants are more likely to die before their first birthday, and develop long-term neurodevelopmental disabilities including cerebral palsy, intellectual disability, and visual and hearing impairment.[1,2] PTBs are also costly. In 2005, the Institute of Medicine (IOM) reported an annual societal economic cost of $26.2 billion associated with PTB ($51,600 per PTB).[1] The combined newborn and maternal cost of prematurity to employers has been estimated to be as high as four times that of uncomplicated births.[3] Hence, preventing PTB is crucial, especially among lower socioeconomic women. The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provides food assistance, education and healthcare referrals to pregnant and post-partum women, and infants and children up to age 5 years at nutritional risk and low-income (Federal Poverty Level ≤ 185%).[4] Nationwide, in 2016, WIC served 2.1 million pregnant and post-partum women, 2.1 million infants and 4.7 million children.[5] California has the highest coverage rate in the country.[6]

Studies have shown that prenatal WIC participation is associated with lower rates of PTB among enrollees.[7,8] However, many of these studies have been criticized for failing to consider potential confounding and selection bias[9,10] which could bias estimates of the effect of WIC on PTB. A recent study showed a persistent moderate protective effect of WIC even after adjusting for selection bias due to gestational age.[10] This finding could translate into improved health for children and societal health savings. One of the most widely cited economic evaluations of WIC on birth outcomes was conducted 25 years ago.[11] This study reported that for every dollar spent on WIC during pregnancy, the cost-savings in Medicaid during the first 60 days of life ranged from $1.77 to $3.13.[11] With the recent substantial changes in health care, rising healthcare costs, changing WIC participation rates, and fluctuating PTB rates of PTB,[12] the current cost savings associated with prenatal WIC participation are unknown. This warrants a re-evaluation of the impact of WIC on cost-savings. In this study, decision analysis and causal inference methods were used to investigate the potential cost-savings that might result from prenatal WIC participation. Specifically, a cost-benefit analysis of WIC at varying levels of prenatal WIC participation in California was conducted.

METHODS

Analytic Overview

A decision-analytic model – defined as "a model used to calculate the expected value of a given health strategy"[13] – was developed to evaluate the economic impact of WIC on PTB, specifically a comparison of the program's costs to the economic value of its effectiveness in preventing PTB.[13] Analyses were performed from a societal perspective (taking into account all economic costs and benefits, regardless of who pays for or receives them)[13] with a time horizon covering the newborn's lifetime.

WIC's costs and benefits were estimated under three different scenarios (Appendix Figure 1):

1. Reference scenario: no WIC, 0% coverage rate. This scenario represented a hypothetical situation where WIC would be absent and no children would participate in the program.
2. Status quo scenario: 84% WIC coverage rate. This scenario represented WIC's coverage rate in the sample on which this analysis was based. In this sample, 84% of eligible women in California were enrolled in the program;[14]
3. Universal coverage scenario: 100% coverage rate. This scenario corresponded to a hypothetical scenario in which 100% of eligible women are enrolled in WIC. We assumed that WIC would operate in the same manner as presently.

To project the potential number of PTBs that could be prevented or added at varying WIC participation rates, the g-computation algorithm, a simulation-based causal inference technique and a generalization of the standardization method for time-varying exposures, was used.[15]A hypothetical experiment was simulated to determine how many new PTB cases would be added (and the associated excess cost) if prenatal WIC participation decreased by amounts ranging from 5% to 100% (among the 84% eligible women enrolled in WIC). Likewise, the number of new PTB cases that could be further prevented (and the associated savings) if prenatal WIC participation increased by amounts ranging from 5% to 100% (among the 16% eligible women not yet enrolled) was calculated.

Statistical analyses and simulations were conducted using SAS 9.4 (Cary, NC). The decision modeling and tree diagram were operationalized using TreeAge (Williamstown, MA). This economic evaluation followed the 2013 Consolidated Health Economic Evaluation Reporting Standards guidelines.[16] Since the study used simulation and aggregated publicly available data, institutional review to protect human subjects was not required.

Base-Case Analyses and Assumptions

Cohort size, WIC coverage, and PTB Prevalence.—The decision model compared program outputs and outcomes of the three scenarios for a hypothetical cohort of 500,000 low-income Californian pregnant women who had a singleton live birth within the past 12 months. This cohort size was chosen since in California, approximately 500,000 women give birth every year.[17–19] Information on WIC coverage was obtained from a 2016 report of WIC utilization, which used data from the 2010–2012 Maternal and Infant Health Assessment (MIHA) survey–an ongoing statewide-representative survey of women residing in California who have had a recent live birth.[14,20] In the MIHA sample, 67% women were WIC-eligible; of the WIC-eligible women, 84% were enrolled in WIC.[14] Any pregnant woman whose household income was no more than 185% FPL or was enrolled in Medicaid was considered WIC-eligible.[14] Data on PTB prevalence were obtained from a study conducted in California that linked live births and infant and fetal deaths using the 2010 California Birth Cohort and the 2010 Census.[10] In this sample, about 7% of live births resulted in a PTB (Table 1). We conducted this study in California since we had access to WIC programmatic activities and costs; further, the estimates of WIC impact and PTB incidence came from a population representative of California.[10]

Effect of WIC on PTB.—We have systematically searched the literature for articles that have investigated WIC's effectiveness on PTB – making an earnest effort to select only those with the strongest study designs. To that effect, the study by Fingar et al[10] was selected to provide an estimate of the effectiveness of WIC on PTB. This study used a fetus-at-risk approach in their design; it is one of the best studies that have addressed selection and gestational age biases. Nevertheless, because no study is bias free and because of the variability in the estimate of WIC's effectiveness on PTB, we have included an extensive sensitivity analysis where we applied our method to other studies that have reported on WIC's effectiveness on PTB. Our study focused on PTBs occurring at 29–36 weeks since data on WIC's effectiveness were limited to PTB occurring during that window.[10] For our analysis, we assumed that the effect of WIC on PTB and the related proportion of PTB among WIC participants and non-participants were the same regardless of scenario (Table 1). Additionally, we assumed that eligible women not initially enrolled in WIC would in fact act the same way as women currently enrolled in WIC if they enrolled in WIC. This is generally referred to as the conditional exchangeability assumption[21] which states that individuals in the general population not initially given the treatment but who are later offered treatment would behave and/or have the same outcome as those randomized or exposed to the treatment.

Intervention Costs.—Program costs included WIC expenditures to support prenatal services following program enrollment and up to birth, including the cost of WIC foods[22] and nutrition services administration (personnel and operating expenses) in California.[23] Since these costs were incurred only during pregnancy, there was no need to discount or adjust for inflation.[24] Thus, although the time horizon (i.e. period over which all costs and outcomes are considered)[13] for this study covers the newborn's life-course, the intervention costs cover only the period of pregnancy (Table 1).

Societal Costs of PTB.—Societal costs of PTB in each scenario included tangible and intangible costs associated with PTB over the life-course. Tangible societal costs of PTB include lifetime direct (medical and educational) and indirect (loss of productivity) economic costs, above and beyond the same types of costs for term births; estimates of these costs have been provided in an IOM report.[1] These IOM cost estimates were discounted at a 3% annual rate and expressed in 2005 constant dollars. For our study, they were adjusted to 2017 dollars using the Consumer Price Index (CPI) to allow for the comparison of these costs and outcomes over the life-course. Discounting is the process by which we convert future costs or health outcomes into present values.[13] For example, a discounted amount of future money is the amount of money it is worth today.

In this cost-benefit analysis, we have considered the costs of WIC from the time of enrollment in WIC to the time of delivery (i.e. pre-birth period) and the lifetime societal costs of PTB (i.e. from the time of delivery until death). This approach was undertaken since the main goal was to see if and how prenatal enrollment in WIC during the entirety of pregnancy would result in some benefits or cost-savings to society due to the prevention of PTB. Since the time after birth in WIC was deemed not relevant to the prevention of PTB under WIC, we did not include the costs of WIC after birth in our analysis. As such, the analysis presented here does not apply to the WIC program after birth.

The IOM estimates did not include intangible outcomes of PTB, such as the economic cost of pain and suffering or of not being in good health. To assess intangible costs, a three-part process was followed. First, lifetime quality-adjusted life years (QALYs) for preterm and term births were calculated. These calculations used estimates from a cost-benefit analysis conducted by Werner and colleagues,[24] which assumed a life expectancy of 78.7 years[25] and utilities of 0 for death during infancy, 1 for 'perfect' health, and 0.96 for prematurity. The utility is a unit of how we value one's health. 'Perfect' health is given a utility value of 1 and death a utility value of 0; a value between 0 and 1 reflects suboptimal health.[13] These lifetime estimates, discounted at a 3% annual rate, are shown in Table 1. Second, a monetary value for one QALY was assigned from estimates reported by Shiroiwa and colleagues in a study of willingness-to-pay (WTP) for one QALY in various countries, including the US.[26] The WTP is the maximum amount a patient, payer or society is willing to pay per unit of increased effectiveness.[13] Finally, the WTP value of one QALY, adjusted to 2017 dollars using the CPI, was multiplied by the difference in lifetime QALYs between preterm and term births, and the result was considered the lifetime intangible cost of one PTB (see Table 1).

Economic Valuation of WIC's Impact on PTB.—Two measures of the economic value of WIC are reported here. First, the societal return on investment (ROI) of WIC was determined by estimating cost-savings for every dollar spent by WIC on program costs. Specifically, tangible (direct and indirect) cost-savings attributed to WIC were divided by the program's costs; intangible costs and outcomes were not included in this measure because they are not included in conventional summary measures of economic output (e.g., gross national product). Second, the program's net monetary benefit (NMB) includes the total (tangible direct and indirect, and intangible) economic value of WIC's impact on PTB, minus the program's costs. Using these measures, an intervention is considered cost-saving if the ROI > 1, and economically beneficial and thus worth implementing compared to the alternative[27] if NMB > 0.

Sensitivity Analysis

First, a tornado univariate sensitivity analysis – a type of sensitivity analysis in which multiple variables are varied over their plausible range one at a time while holding all other variables constant[13] – was performed to assess the robustness of our findings and to identify assumptions that had the most influence on the results. The parameters included in this sensitivity analysis and the range over which they were varied are shown in Table 1. Second, a one-way sensitivity analysis to evaluate the threshold value of the effect-of-WIC-on-PTB parameter on NMB was conducted. This was done by varying the relative risk for the association of PTB with WIC participation from 0.51 to 0.99. Third, we systematically searched PubMed for articles that investigated WIC's impact on PTB to test the impact of their effect estimates on the findings and conclusions of the present study.

RESULTS

Base-Case Analysis

In the hypothetical cohort of 500,000 women, 337,050 (67%) were eligible to enroll in WIC. In the no-WIC scenario, no WIC services were provided to any pregnant woman and the cost totaled $2 billion. In the status quo scenario, WIC provided services to 281,841 pregnant women and the cost totaled $1.7 billion. In the universal coverage scenario, WIC provided services to 337,050 pregnant women and the cost totaled $1.6 billion (Table 2 and Figure 1). The status quo and universal coverage scenarios were both cost-saving, saving $349 million and $418 million and preventing 7,575 and 9,058 PTB among enrolled pregnant women, respectively. It was estimated that WIC saved $1,239 per participant, and a total of $46,118 per PTB prevented. Every $1 spent per participant in both status quo and universal coverage scenarios saved about $2.48 ($1.24 to $6.83) (Table 2). The (incremental) NMBs for the status quo and universal coverage were almost $1 billion and $1.2 billion, respectively, assuming a WTP of $69,747 per QALY gained (or a NMB per participant of $3,489). Since the NMBs for these strategies were positive, they were also considered highly cost-effective approaches to preventing PTB relative to the reference scenario.

Decreasing enrollment in WIC by a percentage ranging from 10% to 100% would result in 983 to 7,514 excess cases of PTB, generating an additional cost of $45.3 million to $346 million. Increasing enrollment of eligible women in WIC by a percentage ranging from 10% to 100% would further prevent 141 to 1,193 PTBs, generating additional savings of $6.5 to $54.9 million (Figure 2).

Sensitivity Analysis

The tornado univariate sensitivity analysis highlighted the most influential variables: the discounted neonatal QALYs for term and preterm babies and the lesser influential variables: WIC expenditures, relative risk, prevalence of PTB, and proportion of WIC enrollees (Appendix Figure 2). The in-depth one-way sensitivity analysis of the effect-of-WIC-on-PTB parameter on NMB showed that as long as WIC prevented 5% or more PTBs (i.e. relative risk ≥ 0.95), WIC would be cost-effective. Additionally, if WIC prevented 10% or more PTBs (i.e. relative risk ≥ 0.90), WIC would be cost-saving (Appendix Figure 3). The extensive sensitivity analysis using nine external studies' parameters showed that all of the studies but one[28] reported estimates consistent with WIC being cost-effective and cost-saving relative to the reference scenario. Among these studies, the tangible economic benefit per participant ranged from $18[29] to $2,994[11] and the incremental NMB per participant ranged from $688[29] to $7,514[11] (Figure 3 and Appendix Table 1).

DISCUSSION

The purpose of this study was to investigate the potential cost-savings from prenatal WIC participation and conduct a cost-benefit analysis of WIC at varying levels of prenatal WIC participation in California. We conducted this analysis from a societal perspective, and thus the resulting cost-savings included both cost-savings pertaining to intervention costs as well as cost-savings due to tangible and intangible costs associated with PTB. Using simulation and modeling approaches,[30,31] this study demonstrated that WIC's standard of care (i.e. status quo) is cost-saving and cost-effective and that WIC could save even more if it were universal. Spending one dollar on prenatal WIC services improves birth outcomes and results in savings ranging from $1.24 to $6.83. A decrease in prenatal WIC enrollment in the hypothetical cohort by just 10% would incur an additional cost (i.e. loss) of about $45.3 million to treat the additional preterm infants. In contrast, increasing prenatal WIC enrollment by 10% would lead to a reduction in PTBs, achieving additional cost-savings.

This study shows similar trends in cost-savings associated with prenatal WIC participation as those reported by Devaney and colleagues.[11] Their evaluation, conducted about 25 years ago, estimated Medicaid cost savings during the first 60 days after birth from a government/healthcare perspective for Florida, Minnesota, North Carolina, South Carolina and Texas.[11] They found that every dollar spent on prenatal WIC was associated with savings ranging from $1.77 to $3.13.[11] Our study differs from this evaluation in that it is conducted from a societal perspective, and it focuses on California and PTB as an outcome. Another study conducted 18 years ago evaluated New York State's Prenatal Care Assistance Program (PCAP). In this study, a reduction in newborn delivery costs associated with PCAP participation were modest, ranging from $100-$300 per participant, and were not sufficient to recover program expenditures.[32] This study focused on costs associated with a reduction in low birth weight while our study focused on PTB prevention. Differences in state-specific costs and risk factors may also have accounted for the difference in findings.

Because of the paucity of economic evaluation studies investigating the impact of WIC on the prevention of PTB, we implemented a sensitivity analysis where we applied the estimates of the impact of WIC on PTB from various relevant studies to the costs and parameters of the present study. Most projected estimates were consistent with WIC being cost-effective and cost-saving relative to the reference scenario. More generally, this endeavor further indicates the need for continuously investigating the costs and benefits of social programs to ensure that they are beneficial for the beneficiaries.

Several potential mechanisms can explain the impact of WIC on PTB prevention. WIC provides vouchers for selected nutritious foods and nutrition education as well as screening and referral to healthcare providers for pregnant women.[33] These services are critical given that inadequate nutrition and prenatal care are associated with increased PTB risk.[34] WIC participation is associated with smoking cessation[35] and improved nutrition[36] while receiving care from prenatal care providers allows for the early treatment of infections and other medical conditions. In addition, any health education provided may reinforce or augment the nutrition education provided by WIC. Further studies are needed to confirm these hypothesized mechanisms.

Study strengths and limitations

This study has several strengths. First, it gives a timely update on the evaluation of WIC's impact on PTB prevention and the consequent cost benefits. Second, it uses relevant data pertaining to California—making it easy to generalize our results to the context of California, which has the largest WIC enrollment in the country. Third, the extensive sensitivity analyses highlighted the robustness of findings.

This study also has several limitations. First, the analysis was not conducted within socio-economic and racial/ethnic subgroups since information on subgroup-specific relative risks for WIC's effect on PTB was lacking. However, it is conceivable that even with the same effect across socio-economic and racial/ethnic groups, a greater benefit might be seen in subgroups that experience higher incidences of PTB (e.g. African-Americans).[37] Additionally, should there be a differential effect of WIC across subgroups, a differential benefit could be expected. This can be seen from the sensitivity analysis in which we varied the effect of WIC and assessed its impact on NMB per participant (Appendix Figure 3). Second, it was assumed that the population was closed and that each pregnant woman could only have a singleton live birth within the one-year study period. This was done to simplify the model and contextualize the sample to those found in the MIHA report and the study conducted by Fingar and colleagues.[10,14] Third, the findings are not necessarily generalizable to extreme PTB (≤ 28 weeks) although only 0.5% of WIC babies are born extremely preterm.[38] Further, our study did not include the impact of WIC on neonatal demise or pregnancy loss; hence our findings are limited to the impact of WIC on PTB prevention. Fourth, the validity and magnitude of our results hinge upon the validity and magnitude of the studies providing estimates of WIC on PTB. The extensive sensitivity analyses suggest that our conclusions are robust. All of the studies but one[28] had estimates consistent with WIC being cost-effective and cost-saving relative to the reference scenario. Finally, these analyses were based on California data and may not be representative of WIC nationally.

CONCLUSION

WIC is a federal program that provides food assistance, nutrition education and referrals to health care for pregnant and post-partum women and children under age 5 at nutritional risk. Hence, evaluations such as this are important for monitoring WIC's impact to ensure that the program remains cost effective from a societal perspective. This study gives an update on the economic evaluation of prenatal participation in WIC, suggests that WIC is cost-saving and cost-effective, and suggests that efforts should be made to increase enrollment of WIC-eligible pregnant women and ensure the retention during the period of the pregnancy. It further suggests that society may save even more if there was universal prenatal WIC coverage. In addition, future research should refine and extend the models to evaluate the economic impact of WIC post-partum and in early childhood.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Supplemental Nutrition Program for Women, Infants, Children (WIC) is cost-savin
- Further savings could be achieved if all eligible women were enrolled in WIC
- $1 invested in WIC saves about $2.48 in medical, educational and productivity costs
- WIC is cost-effective in preventing preterm births relative to having no WIC
- Reductions in prenatal participation could lead to significant increases in costs

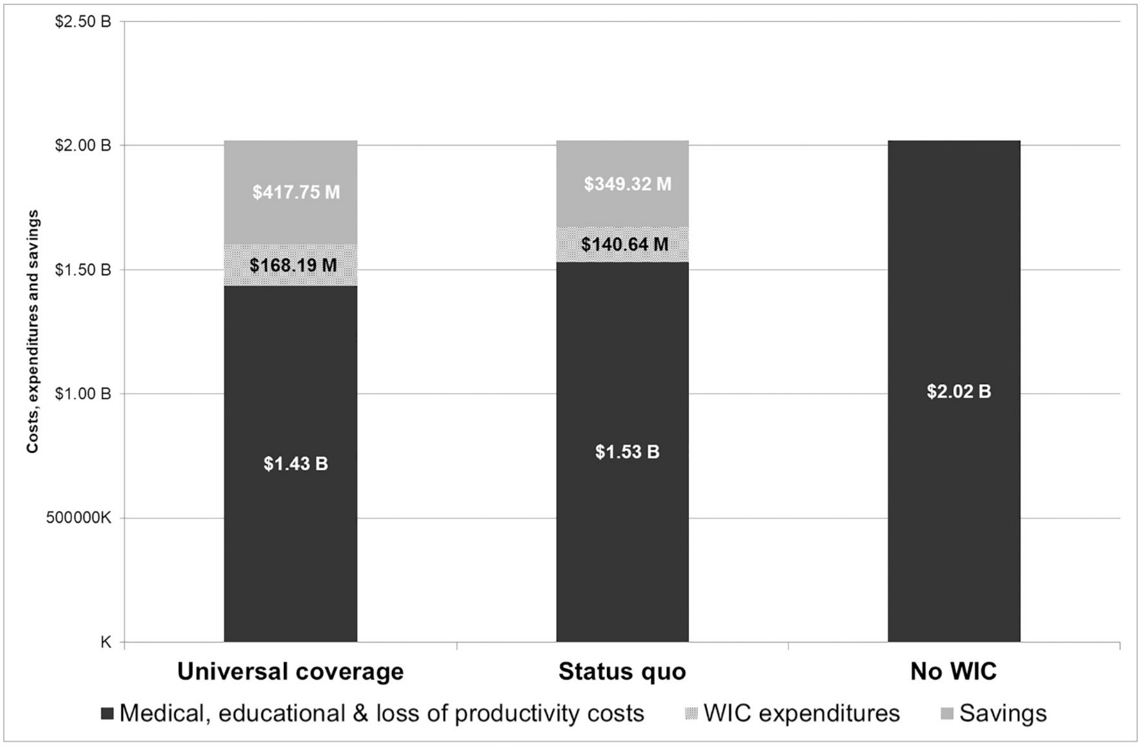

Figure 1. Total additional cost, WIC expenditures and savings in the three simulated scenarios in the hypothetical cohort of eligible pregnant women

The status quo and the universal coverage yield some cost-savings B = Billion, M=Million, K=Thousands

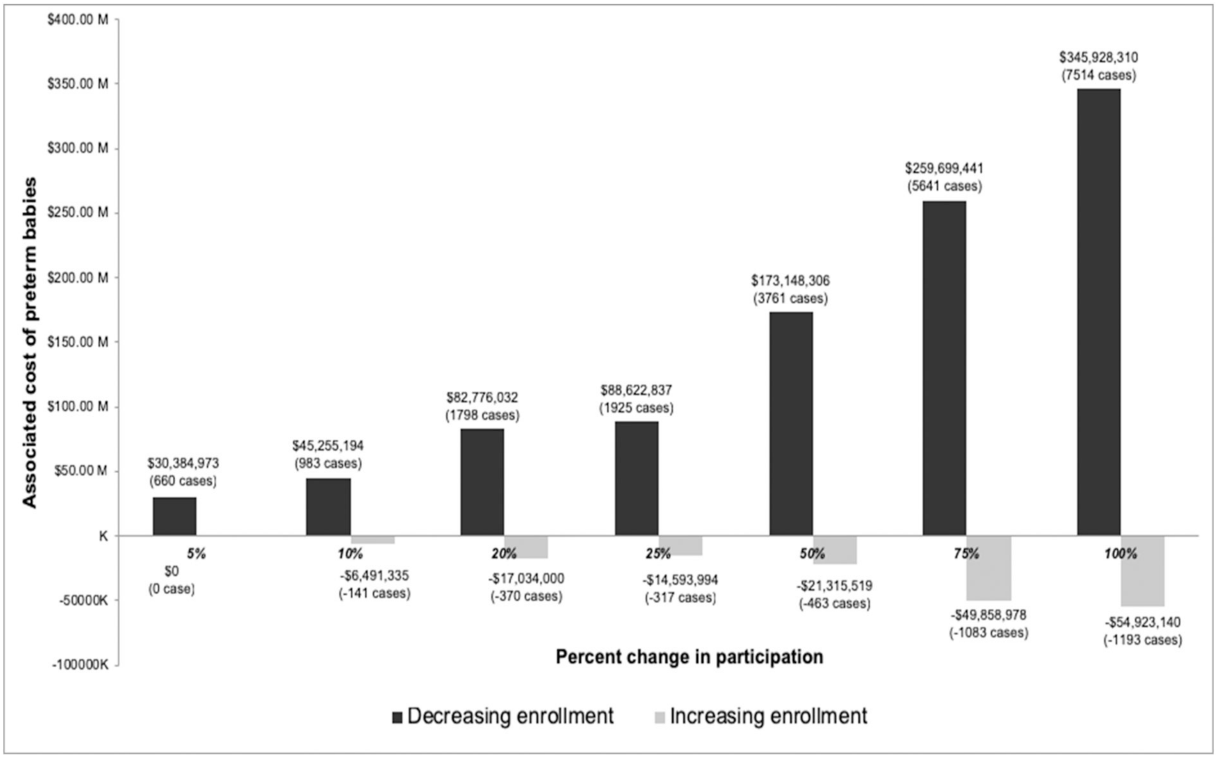

Figure 2. Incremental decrease and increase in WIC enrollment and their effects on PTBs and associated costs in the hypothetical cohort

This graph represents the additional excess cases and associated excess costs that would result if prenatal WIC participation decreased by varying percentages ranging from 5% to 100% (among the 84% eligible beneficiaries). Likewise, it shows the additional cases that could be further prevented and the associated savings that would result if prenatal WIC participation increased by varying percentages ranging from 5% to 100% (among the 16% eligible women not yet enrolled). The cost was obtained by multiplying the number of cases by the cost-savings per PTB prevented ($46,0118)

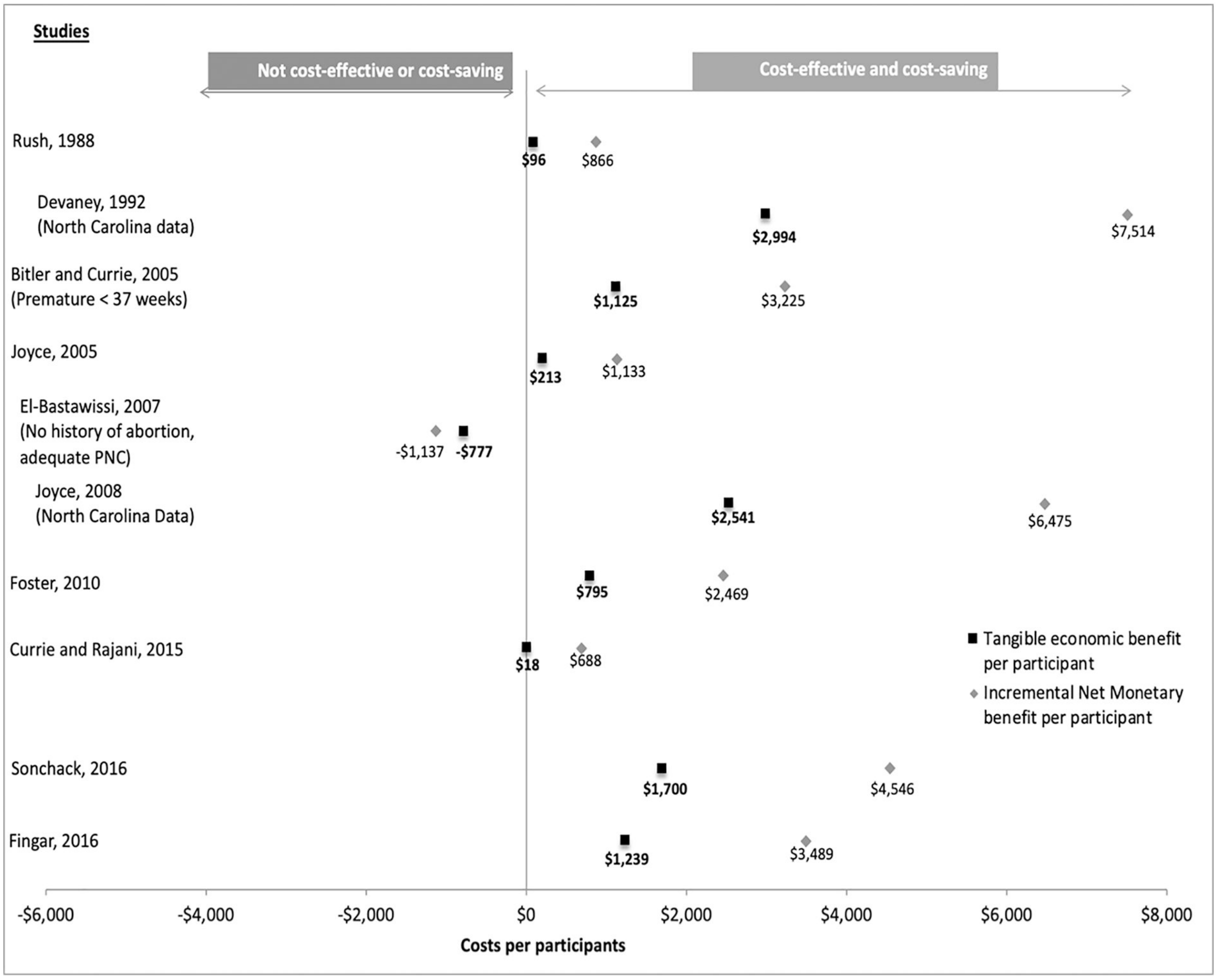

Figure 3. Sensitivity analysis showing the impact of varying the absolute risk reduction as provided by various studies on the tangible economic benefit per participant and on the incremental net monetary benefit under the status quo scenario.

Table 1.

Base-case model: population sizes, relative risk, event probabilities, utilities and costs

	Base Case	Range	Reference
Population size			
Total hypothetical population	500,000		
Total eligible population	337,050		
Total eligible women who are enrolled in WIC	281,841		
Eligible women not enrolled in WIC	55,209		
Relative risk			
Relative risk (RR) for PTB for WIC participants	0.71	0.51–0.99	Fingar and colleagues[10] Bitler and colleagues[8]
Probabilities			
Proportion of eligible women (%)	67.41		MIHA report[14]
Proportion of participating women in WIC among eligible women (%)	83.62	0–100	MIHA report[14]
Prevalence of PTB among singleton live births in eligible California residents in the status quo (%)	7.02	0.01–17	Fingar and colleagues[10] Bitler and colleagues[8]
Proportion of PTB among eligible women not participating in WIC (%)	9.27		*Derived from Fingar and colleagues[10]
Proportion of PTB among WIC participants (%)	6.58		*Derived from Fingar and colleagues[10]
Quality-life Adjusted Years (QALYs)			
Life expectancy (years)	78.7		Hoyert and colleagues[25]
Utility for term babies	1	0.956–1	Werner and colleagues[24] Petrou and colleagues[39]
Utility for preterm babies	0.96	0.789–0.96	Werner and colleagues[24] Petrou and colleagues[39]
Total QALYs for preterm babies	28.9	18.8–75.6	Werner and colleagues[24]
Total QALYs for term babies	30.1	19.6–78.7	Werner and colleagues[24]
Discounting rate (%)	3	0–5	
WIC expenditures per participant **	$499	$222 - $776	PHFE-WIC[23]
Cost per case ***			
From the societal perspective (additional cost)			
PTB	$64,686		IOM report[1]
Non-PTB	$0		IOM report[1]
Willingness-to-pay (WTP)	$69,747		Shiroiwa (ref)

* the proportion of PTB among WIC participants and non-participants were derived using parameters from the Fingar and colleagues article[10] (i.e. assuming a relative risk of 0.71, a total prevalence of PTB of 7.02%) and MIHA report (i.e. proportion of WIC coverage of 83.62%) (appendix Figure 5 for details)

** To calculate the costs to WIC, we obtained a mid-point average of the cost associated with a minimum enrollment of 1 month ($222) and that associated with an enrollment for the entirety of the pregnancy (e.g. 9 months) ($775).

*** adjusted to 2017 $US using the Consumer Price Index; LBW=low birth weight; PTB = preterm birth(s)

Table 2.

Summary of the economic benefits under the three strategies (societal perspective) for a hypothetical cohort of 500,000 low-income Californian pregnant women

Outcome	Reference Scenario	Status Quo	Universal Coverage
Number of participants in intervention group	0	281,841	337,050
Total PTB	31,235	23,661	22,177
Number of PTB prevented	0	7,575	9,058
Total WIC costs	$0	$140,638,764	$168,187,950
Total Cost Savings	$0	$348,324,099	$417,751,852
Cost savings per participant	--	$1,239	$1,239
Cost savings per PTB prevented	--	$46,118	$46,118
Savings to cost ratio	--	1:2.48	1:2.48
Return on Investment ($ saved per $ 1 spent)	--	$2.48 ($1.24 to $6.83)	$2.48 ($1.24 to $6.83)
Total Neonatal QALYs	10,107,722	10,116,812	10,118,592
Incremental neonatal QALY (effectiveness)	--	9,089	10,870
Total Net Monetary Benefit (NMB)	$702,963,746,683	$703,947,032,683	$704,139,644,794
Incremental NMB	--	$983,286,000	$1,175,898,111
Net Monetary Benefit per participant	--	$3,489	$3,489
Cost of Scenario	$2,020,482,076	$1,671,157,977	$1,602,730,224

Number of PTB prevented = (Absolute risk reduction)*(# of participant in intervention group) where Absolute risk reduction = (9.27% - 6.58%=2.69%); Total WIC cost = (WIC expenditure per participant)*(# of participant in intervention group) where WIC expenditure per participant = $499; Total Cost savings = (Number of PTB prevented)*(Cost per PTB) – (WIC expenditure per participant)*(# of participants in the intervention group) where Cost per PTB=$64,608; (Incremental) Net Monetary Benefit = Increase in Effectiveness*Willingness-To-Pay – Increase in Cost of intervention where Willingness-To-Pay = $69,747/QALY gained.

The status quo and universal coverage strategies are compared to the reference scenario (i.e. No WIC). The universal coverage has 1,484 fewer PTB than the status quo. QALY = Quality-Adjusted Life Years; PTB= Preterm Birth(s)