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What's Behind Her Smile? Health, Looks, and Self-Esteem[†]

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This paper examines how improving dental health affects economic, social, and psychological outcomes. In a randomized experiment, we provide a low-income group free dental care, including prostheses, and find significant and persistent impacts on men's and women's dental and self-perceived mental health. For women, treatment generates improvement in self-esteem, a higher likelihood of smiling when photographed, short-run improvements in employment and earnings, and improvement in partner interactions. We find no impact for men in these dimensions. Heterogeneity analyses suggest that treatment effects on labor market outcomes are larger for women with more severe visible dental issues at baseline. (*JEL* D12, D91, I12, J16, O12)

The negative consequences of poor oral health include functional limitations, pain, and adverse general health (Slade et al. 2005; Sanders et al. 2006; Lamster et al. 2008); fewer job opportunities (Glied and Neidell 2010), possibly due to physical or psychological discomfort and reduced ability to obtain jobs requiring face-to-face interaction; and degradation of psychological attributes such as self-esteem, which can have economic and social impacts (Bowles et al. 2001; Almlund et al. 2011; Bénabou and Tirole 2002; Blau and Kahn 2017). Despite knowledge of these negative effects, access to high-quality dental care is limited in both developing and

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developed countries, and the socioeconomic gradients in dental health outcomes are large (Gallego et al. 2017). Thus, the first goal of this paper is to examine the effects of providing free dental care on health, economic, social, and psychological outcomes in low-income populations. To this end, we designed and implemented a randomized intervention offering free dental health services, including dental prostheses, with an estimated market value of approximately US$800, to a low-income group in Chile.

The second goal of this paper is to determine whether treatment effects are heterogeneous by gender, as oral health may play a role in labor market gender gaps. In particular, effects may be larger for women due to the role that psychological attributes like self-esteem and self-confidence play in labor market gender gaps (Blau and Kahn 2017) and may be even larger for poor women (World Bank 2011). These issues might be exacerbated by the larger socioeconomic gradients in oral health outcomes for women versus men (Tchicaya and Lorentz 2014). Finally, because dental health affects physical appearance,[1] women might be more affected since they are more likely to work in face-to-face jobs.[2]

The third goal of this paper is to understand the underlying mechanisms of how oral health affects labor market outcomes. As dental health's visible component is more malleable than other observable attributes such as height or weight, we exploit the marked change in physical appearance produced by the dental treatment provided by the program. For this purpose, prostheses play a crucial role. Thus, we study whether treatment effects on labor market outcomes are stronger for people whose physical appearance was more strongly affected by the program.

To achieve our goals, we targeted working-age, low-income adults living in the greater Santiago area in Chile. In early 2011, 799 applicants enrolled in the program. We randomly allocated 350 to receive the intervention and 449 to the control group. We collected baseline data on clinical oral conditions, self-perceived oral health, self-esteem, socioeconomic status, employment status, and other relevant covariates. We collected similar data in two follow-ups, approximately one and three years after treatment completion. The sample comprises people with relatively significant dental health problems. Per the nationally representative National Health Survey (*Encuesta Nacional de Salud*, ENS 2009–2010, Ministry of Health 2010), participant age and education levels were similar to those of the target population in need of dental prostheses. However, they were more likely to be female and employed. We focus on intention-to-treat (ITT) estimates, comparing subjects who received a treatment offer against the control group. We also present instrumental variables (IV) estimates to analyze short- versus medium-run differences in treatment effects.

We report five main sets of results. First, we find that subjects offered treatment improved oral health in several dimensions. For example, use of dental services and

[1] For related literature, see Hamermesh and Biddle (1994); Biddle and Hamermesh (1998); Mobius and Rosenblat (2006) for beauty; Case and Paxson (2008); Persico et al. (2004) for height; and Averett and Korenman (1996) and Conley and Glauber (2006) for obesity.

[2] According to ILO statistics (ilostat.ilo.org/topics/employment), women in upper-middle and high-income countries are more likely than men to hold jobs in service sectors. Chile is no exception, since female employment rates are much higher than male in its retail, hospitality, education, and healthcare sectors. Chile's official labor market statistics are available at www.ine.cl.

objective dental health evaluations improved significantly. We also find significant treatment effects on self-perceived oral health in both follow-ups. In addition, we find that women offered treatment were more likely to smile in follow-up photographs. This behavioral difference suggests that the visible component of treatment is more relevant for women than men.

Second, turning to psychological outcomes, we find an impact on self-esteem in the first follow-up, but significant only for women. This effect remains prominent in the second follow-up—i.e., the effect persists three years after treatment. This result suggests that this psychological channel may only be relevant for women, confirming the role that subjective (self-perceived) oral health may have for them.

Third, the program impacted several quality-of-life dimensions with similar effects for men and women. In particular, we find statistically and economically significant effects on self-reported mental health in the second follow-up. In addition, we find positive but insignificant effects on self-reported physical health.[3] We also find similar effects on appearance-related expenditures across gender. However, some impacts are statistically significant only for women. We document that while treatment does not affect the extensive margin of the marriage/partnership market (i.e., formation and dissolution of marriages and domestic partnerships), relationship quality improved significantly for women. This aspect includes interactions like giving gifts more frequently and, most notably, a lower frequency of serious arguments with their partners, being forbidden to do activities, and verbal abuse.

Fourth, we find positive labor market effects for women in the short term. There is a significant effect on the extensive margin of women's employment and a minimal and nonsignificant impact on men's employment. These results are noteworthy given that women in our experiment have relatively high baseline employment rates. While the extensive margin effect decreases and becomes statistically insignificant in the second follow-up, we cannot reject the null hypothesis that the impact is equal across surveys. We also find an economically meaningful effect on the intensive margin of earnings for individuals working at baseline. In the first follow-up, women's labor income rises by 100 log points while men see much smaller effects (approximately 7 log points). In the second follow-up, this effect on female earnings decreases and becomes statistically insignificant. However, we again cannot reject the hypothesis that treatment effects are equal in both follow-ups.

Interestingly, when comparing trends in employment rates between women in the treatment and control groups, the decrease in treatment effects may be driven by an increase in the employment rate of the control group. This finding is consistent with the upward trend in female employment rates observed in Chile in recent decades. Thus, this result suggests that treatment brought forward only temporary employment increases. Alternatively, the difference in short- and medium-run effects could be because, after some time, the control group had access to dental care outside the program. Additionally, the impact may have faded because the dental treatment depreciated—e.g., lost or damaged prostheses. However, IV estimates results, which take into account changes in dental health across surveys, suggest

[3] We did not gather mental and physical health information in the first follow-up.

this is not the case. Thus, despite the significant effects for women, treatment does not seem economically transformative. Therefore, it is unlikely that most of our results, such as those related to quality of life, are driven by income effects.

Finally, we explore heterogeneous effects on self-esteem, oral health-related quality of life, and labor market outcomes to understand the mechanisms behind the results. We find that dental health's visible components are relevant for labor market outcomes only for women. The effects for men and on self-esteem and oral -health-related quality of life are less clear. This result suggests that looks may be a channel pertinent to understanding at least partially the labor market effects of the treatment studied in this paper.

This paper contributes to five lines of research. The first is the economic impacts of dental health. In addition to using a randomized controlled trial, our study differs from previous research in analyzing the impact of dental health and aesthetics on several economic, social, and psychological outcomes. We also examine the mechanisms behind these effects. Our results complement the pioneering study by Glied and Neidell (2010), which exploits the quasi-random timing of the adoption of community water fluoridation in the United States in the 1960s and 1970s to identify the impact of childhood exposure on future earnings. It finds that childhood exposure to water fluoridation increases earnings, with an effect concentrated among women—primarily those from low-income families—and no effect among men. Our study finds evidence that appearance plays an important role in the impact of oral health on labor market outcomes.

Second, our study contributes to the literature on the effects of health interventions on economic, social, and physiological dimensions (e.g., Dupas and Miguel 2017). In particular, we study the impacts of oral health, an issue that significantly affects quality of life and has been under-studied in the economic literature. We find significant effects on dental and self-perceived mental health but not on self-perceived physical health. Overall, our results suggest that general health effects do not explain the effects of treatment on economic outcomes.

Third, our results contribute to the literature on self-esteem and psychological welfare determinants. For example, Haushofer and Shapiro (2016) estimate the impact of an unconditional cash transfer program in Kenya on psychological well-being, finding a significant positive impact on happiness and life satisfaction and a significant negative one on stress and depression. Although the authors find no significant effects on self-esteem for their overall sample, they observe an impact in households where women receive the transfer. This result is consistent with our finding of a relevant treatment effect only for women. In the same line, our paper contributes to the research on the psychological aspects of poverty (e.g., Duflo 2012; Haushofer and Shapiro 2016; Devoto et al. 2012).

Fourth, our results on the quality of women's partner relationships contribute to the empirical literature on women's agency and welfare (Duflo 2012; Jayachandran 2015; McKelway 2021). Our results suggest that treatment improves women's outside options if they separate from their partners. Alternatively, improving women's looks and self-esteem may lead to more satisfied or happier partners, which may improve women's welfare. Importantly, we show that treatment improves several dimensions of women's welfare that maintain in the medium-term.

Finally, our analysis sheds light on the underlying mechanisms behind the effects of looks and visible attributes on labor market outcomes by studying the impact of a marked change in appearance on employment and earnings. The literature has proposed several theories for why markets reward observable attributes. They include employer preference for these visible attributes, greater self-confidence, and a correlation between observable attributes and investments made in earlier life-cycle stages (Blinder 1974; Killingsworth 1977; Hamermesh and Biddle 1994; Persico et al. 2004; Case and Paxson 2008). While we do not find persistent impacts on labor market outcomes, we do find economically and statistically significant effects on employment and earnings that are stronger for women missing front teeth at baseline.

The remainder of the paper is structured as follows. Section I outlines the dental health care system and labor markets in Chile. Section II describes the research design and methodology. Section III presents the main results, while Section IV provides further evidence of the mechanisms behind the treatment effects. Section V concludes.

I. Background

The use of dental services is limited in Chile, especially for the poor. The nationally representative survey ENS 2009–2010 found that 28.7 percent of adults had not visited a dentist during the past 5 years (18 percent in the top income quintile and 32 percent in the bottom quintile). The fraction includes 4.5 percent who had never had a dental checkup.[4]

Consequently, dental health in Chile is poor. For example, 72 percent of adults miss at least 1 tooth (ENS 2004). The problem is particularly acute among low-income individuals (18 percent of individuals in the lowest-income quintile have complete dentition versus 49 percent of those in the top) and women (36.6 percent of women have 20 teeth or less compared to 27.8 percent of men),[5] which is a pattern consistent with dental health outcomes in other countries.[6]

The steep socioeconomic gradients in dental care services and dental health status are partially a result of the limited supply of services for the publicly insured, who are largely poorer than the privately insured. In Chile, health insurance contributions are mandatory, and individuals must choose between private insurers and the public insurance (*Fondo Nacional de Salud*, also known as FONASA). Approximately 80 percent of the population is insured by FONASA (Ministry of Social Development and Family 2015). Because FONASA only offers basic dental care that excludes appearance-related treatments, such as dental prostheses, and has years-long wait times for receiving functional treatments (Cantarutti et al. 2019), a public insuree

[4] On average, OECD residents visit the dentist 1.3 times per year. In the United States, the average is 1, and in Chile, 0.7. In addition, roughly 60 percent of high-income US residents visited a dentist in the past 12 months versus just over 20 percent of those in low-income groups (OECD 2011). In Chile, the respective rates are 54 percent and 30 percent (ENS 2009–2010).

[5] Adults with complete dentition have 32 teeth.

[6] Most studies on oral health gradients refer to developed countries where public healthcare is relatively strong and the private sector plays an important role in the provision of dental care. However, even in these contexts, the literature consistently finds significant socioeconomic gradients. See Gallego et al. (2017).

would have to pay the entire cost out-of-pocket at a private clinic in order to receive excluded treatments or functional treatments in a shorter time frame. Although we do not have detailed information on the quality of care provided by private clinics, anecdotal evidence suggests that the care they provide to low-income populations may be of low quality.[7]

Because poor dental health might contribute to poverty, especially among women, public programs have emerged to address the issue. Particularly relevant is the *Sonrisas de Mujer* program implemented in 2000 by Chile's then-First Lady Luisa Durán, which sought to improve women's self-esteem by offering dental prostheses to women missing front teeth and treated more than 25,000 women. Similarly, in 2012, the government launched a pilot program that provided dental prostheses to approximately 1,500 male and female FONASA beneficiaries. However, these programs were short-lived and relatively small and thus failed to address the vast number of Chileans lacking access to expanded dental services and prostheses.

Chile's labor market participation and employment rates among the poor are similar to those of other emerging countries. Overall, 70.1 percent of men and 43.5 percent of women are active in the labor market, and nearly 66 percent of men and 40 percent of women are employed (Ministry of Social Development and Family 2015). However, participation and employment rates are much lower among the poor: 53 percent of men and 27.6 percent of women in the poorest quintile are active, and only 43.2 percent of men and 20.2 percent of women in this group are employed. It is also important to note that Chilean women's labor force participation has significantly increased in the last decades; the 1990 and 2011 CASEN surveys show that women's participation increased from 31.5 percent to 43.3 percent.

II. Research Design and Methods

In this section, we describe the intervention and data sources. We also assess balance in covariates at baseline and follow-ups and attrition. Finally, we describe the methods used to estimate treatment impact.

A. *Experimental Sample and Program Implementation*

The free dental service program was designed and implemented by the research team and professionals of a private network of dental clinics. The services included: a diagnostic exam, a panoramic x-ray, a personalized treatment plan, dental hygiene, simple extractions, crown polishing, fillings, seals, and removable metal-acrylic prostheses, with a total estimated price of about US$800.[8] Eligibility criteria for the program required that individuals: (i) live in the greater Santiago area (due to the location of the clinics), (ii) be between 18 and 60 years old (working age), and (iii) be enrolled in the public health system (FONASA). To participate, individuals

[7] For example, we found 5,560 complaints against dentists on the popular website www.reclamos.cl, which is more than those against pediatricians (1,540), surgeons (2,120), and physical therapists (1,292) combined. Information accessed on September 14, 2018.

[8] Equivalent to 19 percent of the annual minimum wage in Chile in 2011.

had to apply by phone or internet to receive an invitation to a dental examination to assess their needs.

The program was announced in January 2011 in mass media (including radio, newspapers, and television), through pamphlets in various locations, and through letters sent to several local government offices. A total of 3,243 individuals completed the enrollment procedure; of these, 1,419 attended the appointment. Compared to the pool of all eligible individuals needing dental prostheses, the individuals who attended the appointment had similar ages, educational levels, and FONASA plans. However, they were more likely to be female, married, and employed.[9] This has implications on external validity, as our results have greater relevance for people who resemble our sample. More research is needed to study whether our results apply to other populations. However, our discussion of heterogeneous effects and the mechanisms behind our results allow us to identify groups for which the impacts are stronger and, therefore, help us to scrutinize the external validity of our results.

Individuals who attended the dental appointment had to complete a baseline survey about self-perceived oral health, self-esteem, and socioeconomic characteristics. Those with preexisting conditions (hypertension, diabetes, acute gingivitis, or hemophilia) and those receiving treatment for cardiac conditions were not eligible due to medical risks. The sample was further restricted to target participants with relatively severe dental health problems, that is, those (i) missing at least one front or premolar tooth or (ii) in need of upper and/or lower prostheses. These requirements restricted the sample to 799 individuals from whom 350 were randomly selected to receive the intervention. The sample was stratified by income, age, gender, and self-esteem.[10] It is worth noting that the socioeconomic characteristics of the final sample do not differ statistically from those of the complete applicant pool. The exceptions are age and dental health status (i.e., individuals in the final sample are older and have worse dental health; see Gallego et al. 2017 for more details).

Program implementation began in May 2011. Treatment started with a diagnostic exam, followed by a free treatment plan offer. The patients were also informed about treatment options not covered by the program. The initial goal was to complete program implementation within two to three months. However, the implementation timeline had to be adjusted since some dental providers with assigned patients dropped out of the program. Thus, even though the first patients began treatment in May, some started in August, September, and even October. Furthermore, in October 2011, two of the largest clinics dropped out, leaving 115 individuals with unfinished treatments. In December, these patients were reassigned to a new clinic, with 100 of them completing the program before April 2012. Eventually, all subjects assigned to the treatment group attended an appointment to assess their needs, but

[9] Comparison data comes from the enrollment data and information for all eligible individuals who wear or need prostheses in the ENS 2009–2010 survey. Results are available upon request.

[10] All these variables, except gender, were grouped into terciles.

only two-thirds completed the program. In the end, the average and median length of treatment was five months.[11]

B. *Data*

Data in this study came from three sources: a baseline assessment and two follow-ups. The baseline consisted of an oral health examination performed by dental students[12] and a survey that included the following:

- The Oral Health Impact Profile (OHIP). We measured oral health-related quality of life using the OHIP-14 developed by Slade (1997) and translated into Spanish. The 14 questions capture 7 dimensions: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicaps. Questions are answered on a 5-point Likert scale, and scores range from 0 to 56.[13]

- The Rosenberg Self-Esteem Scale. We measured self-esteem using the Rosenberg Self-Esteem Scale (Rosenberg 2015), which has been extensively used in psychology and, more recently, in economics (e.g., Bowles et al. 2001; Almlund et al. 2011). It consists of 10 statements on overall feelings of self-worth evaluated on a 4-point Likert scale. Scores range from 0 to 30; a higher score indicates higher self-esteem. We use the Spanish version validated for Chilean adults by Rojas-Barahona et al. (2009).

- Socioeconomic Variables. We collected data on a wide range of demographic and socioeconomic variables, including age, sex, marital status, number and age of children, labor market outcomes, education, and income.

The first follow-up was conducted in the second half of 2012 (on average one year after treatment completion); the second was conducted in late 2014 and early 2015 (on average three years after treatment completion). Both follow-ups included the OHIP, the Rosenberg Self-Esteem Scale, and questions related to labor market outcomes. However, the first follow-up also included an oral health examination performed by dental students and a photograph of each participant's face, which was rated using the instrument developed by Eli et al. (2001) and Kershaw et al. (2008).[14] In contrast, the second follow-up included questions

[11] We studied whether treatment effects varied by time of treatment completion and did not find any significant heterogeneous impact along this dimension. Results are available upon request.

[12] The dental examination lasted approximately 10 minutes and was designed by the World Health Organization (1997).

[13] To ease interpretation, in the econometric analysis of this paper, we reversed the scale so that higher scores indicate greater perceived oral health.

[14] This instrument measures four personality traits based on appearance: social competence, intellectual ability, psychological adjustment, and relationship satisfaction, each on a 0 (worst outcome) to 4 (best outcome) scale. Five observers independently rated the photographs. These observers hold degrees equivalent to bachelor's degrees in management. We used the average of their ratings but experimented with the median with similar results.

related to self-perceived physical and mental health status,[15] the marriage market, intra-household relationships, and appearance-related expenditures.[16]

C. *Balance and Attrition*

To assess the validity of the random assignment, we test for differences between the control and treatment groups in several baseline variables for both the complete sample and the subsample of individuals we could contact for each follow-up. We present summary statistics for each group and the mean-difference test after controlling for stratification variables.

Table 1 presents descriptive statistics for the sample at baseline and the first and second follow-ups. The baseline sample contains all 799 individuals included in our experiment and comprises individuals who average 48 years of age, are mostly female (70 percent), are heads of households (76 percent), are either married or have a domestic partner (58 percent), average 4.3 members in their households, and average 10.7 years of schooling, with a large fraction not having completed secondary education (44 percent). Notably, while 71 percent of the individuals are employed, only 47 percent have formal employment.

The FONASA plan in which individuals are enrolled serves as a good proxy for socioeconomic status (Gallego et al. 2017). FONASA is structured into four plans: from plan A for the poorest individuals to plan D for the least poor.[17] Most of the individuals in our sample (61 percent) are in plans A or B, which is consistent with an average monthly labor income of about CLP$167,680 (US$335).

Regarding self-esteem, individuals in the baseline sample have an average Rosenberg score of 17 (on a 0 to 30 scale), with 26 percent scoring below 15, which suggests low self-esteem.[18] In terms of oral health, individuals are missing 11 teeth, of which 1.5 are front teeth. The average OHIP score is 36 (on a scale from 0 to 56, with higher scores indicating worse oral health).

In sum, our baseline sample is characterized by high employment rates, low self-esteem, and poor subjective and objective oral health status. Also, women represent a large part of the sample.

Columns 2 and 3 of Table 1 present averages by gender at baseline (panel A), and column 4 reports the *p*-value of a mean-difference test across gender. While we do not observe significant differences for variables such as age, household size

[15] We use the SF-12 questionnaire (Ware Jr et al. 1996), which evaluates the impact of health on everyday life summarized into two components: physical and mental health. Scores range from 0 to 100, with higher scores for better health-related quality of life. The physical health index includes physical functioning, bodily pain, general health perception, and role-health (health issues interfering with work and activities), and the mental health index includes energy and vitality, social functioning, role-emotional (emotional issues limiting work and activities), and mental health perception.

[16] The approved protocol included compensation of a CLP$5,000 supermarket chain gift card equivalent to about US$9 and US$7.4 for participants in the first and second follow-ups, respectively. Note that the second follow-up was less invasive as it did not include a photograph or dental examination.

[17] Individuals in plan A have no income, individuals in plan B earn below US$420 (Col$210,000) per month, individuals in plan C earn between US$420 and US$613 (CLP$306,600) per month, and individuals in plan D earn above US$613 per month.

[18] Rojas-Barahona et al. (2009) reports a mean and median score of approximately 22 and a tenth percentile score of 17.

Table 1—Descriptive Statistics

	Mean (1)	Men (2)	Women (3)	*p*-value (4)
Panel A. Baseline				
Age	47.87	48.10	47.77	0.59
Gender	0.70	0.00	1.00	.
Married or cohabitates	0.58	0.71	0.52	0.00
Head of household	0.76	0.92	0.68	0.00
Number of residents at home	4.27	4.26	4.27	0.99
Residents under 5 years at home	0.34	0.32	0.35	0.61
Residents between 5 and 18 years at home	1.14	1.03	1.19	0.05
Adults at home	2.66	2.73	2.63	0.30
Residents over 65 years at home	0.15	0.16	0.14	0.66
Education 8 or fewer years	0.25	0.19	0.28	0.01
Education between 9 and 11 years	0.19	0.21	0.19	0.43
Education 12 years	0.38	0.44	0.35	0.03
Education more than 12 years	0.18	0.16	0.18	0.54
Years of education	10.71	10.99	10.58	0.04
Employed	0.71	0.88	0.64	0.00
Labor income (in thousand pesos)	167.68	242.63	135.90	0.00
Has a contract	0.47	0.67	0.39	0.00
Fonasa A	0.32	0.26	0.34	0.02
Fonasa B	0.29	0.27	0.30	0.40
Fonasa C	0.27	0.28	0.26	0.63
Fonasa D	0.12	0.19	0.09	0.00
OHIP score	36.04	33.10	37.29	0.00
Rosenberg score	17.40	18.68	16.85	0.00
Number of missing teeth	10.65	10.64	10.65	0.97
Number of front missing teeth	1.45	1.58	1.40	0.30
Upper prosthetic need	0.94	0.96	0.94	0.18
Lower prosthetic need	0.92	0.91	0.93	0.48
Observations	799	238	561	
Panel B. First follow-up				
Age	48.11	48.67	47.89	0.26
Gender	0.72	0.00	1.00	.
Married or cohabitates	0.58	0.72	0.52	0.00
Head of household	0.74	0.94	0.67	0.00
Number of residents at home	4.30	4.39	4.27	0.38
Residents under 5 years at home	0.34	0.32	0.34	0.74
Residents between 5 and 18 years at home	1.16	1.08	1.20	0.22
Adults at home	2.67	2.80	2.63	0.09
Residents over 65 years at home	0.15	0.17	0.15	0.50
Education 8 or fewer years	0.24	0.16	0.27	0.00
Education between 9 and 11 years	0.19	0.23	0.18	0.14
Education 12 years	0.38	0.44	0.36	0.05
Education more than 12 years	0.18	0.17	0.19	0.56
Years of education	10.75	11.11	10.61	0.02
Employed	0.71	0.88	0.64	0.00
Labor income (in thousand pesos)	166.40	243.70	136.16	0.00
Has a contract	0.47	0.67	0.39	0.00
Fonasa A	0.32	0.24	0.35	0.00
Fonasa B	0.29	0.27	0.30	0.42
Fonasa C	0.27	0.29	0.26	0.54
Fonasa D	0.12	0.20	0.08	0.00
OHIP score	35.97	32.37	37.37	0.00
Rosenberg score	17.41	18.91	16.82	0.00
Number of missing teeth	10.70	11.01	10.58	0.41
Number of front missing teeth	1.45	1.66	1.37	0.15
Upper prosthetic need	0.94	0.96	0.93	0.24
Lower prosthetic need	0.93	0.91	0.93	0.27
Observations	642	180	462	

(*continued*)

TABLE 1—DESCRIPTIVE STATISTICS (*continued*)

	Mean (1)	Men (2)	Women (3)	*p*-value (4)
Panel C. Second follow-up				
Age	48.47	49.18	48.20	0.15
Gender	0.73	0.00	1.00	.
Married or cohabitates	0.60	0.76	0.53	0.00
Head of household	0.75	0.95	0.67	0.00
Number of residents at home	4.32	4.47	4.26	0.21
Residents under 5 years at home	0.34	0.36	0.33	0.69
Residents between 5 and 18 years at home	1.18	1.10	1.21	0.27
Adults at home	2.70	2.85	2.64	0.07
Residents over 65 years at home	0.14	0.15	0.14	0.71
Education 8 or fewer years	0.24	0.21	0.26	0.19
Education between 9 and 11 years	0.19	0.22	0.18	0.36
Education 12 years	0.39	0.44	0.37	0.13
Education more than 12 years	0.17	0.13	0.19	0.10
Years of education	10.75	10.85	10.72	0.58
Employed	0.70	0.88	0.63	0.00
Labor income (in thousand pesos)	163.57	243.76	133.11	0.00
Has a contract	0.46	0.67	0.39	0.00
Fonasa A	0.32	0.25	0.35	0.02
Fonasa B	0.29	0.29	0.29	0.86
Fonasa C	0.27	0.27	0.28	0.94
Fonasa D	0.11	0.19	0.08	0.00
OHIP score	36.12	32.21	37.59	0.00
Rosenberg score	17.33	18.71	16.81	0.00
Number of missing teeth	10.97	11.16	10.90	0.65
Number of front missing teeth	1.55	1.72	1.48	0.28
Upper prosthetic need	0.95	0.95	0.94	0.92
Lower prosthetic need	0.93	0.92	0.93	0.57
Observations	547	150	397	

Notes: This table presents averages for the complete sample, for women, and for men. The table also presents the *p*-value for the test of differences of means between women and men for each variable in each sample.

and composition, and objective oral health status, we do observe significant differences in some important characteristics. For example, women are less likely to be married and heads of household. They also are less educated, are less likely to be employed, earn less, are more likely to be in FONASA plan A, and have worse OHIP and Rosenberg scores. Thus, women tend to have worse economic, subjective dental health, and psychological statuses at baseline.[19] However, it is particularly noteworthy that women in the sample have a higher employment rate than the total low-income population in Chile.

Table 2 provides balance tests. When comparing individuals in the control and treatment groups at baseline (panel A), we observe that they are highly similar in socioeconomic variables, self-esteem, and oral health. In addition, we only observe differences in the percentage of individuals who are heads of household (79 percent in the treatment group compared to 73 percent in the control group) and the percentage who have more than 12 years of education (14 percent in the treatment

[19] We examined whether the gender differences in estimated treatment effects are driven by those reported in Table 1. Our results, available upon request, suggest that this is not the case.

Table 2—Balance Tests

	Treatment (1)	Control (2)	Difference (3)
Panel A. Baseline			
Age	48.15	47.65	0.86
Gender	0.71	0.69	0.86
Married or cohabitates	0.57	0.58	0.97
Head of household	0.79	0.73	0.02
Number of residents at home	4.35	4.20	0.19
Residents under 5 years at home	0.34	0.34	0.94
Residents between 5 and 18 years at home	1.15	1.13	0.71
Adults at home	2.71	2.62	0.33
Residents over 65 years at home	0.16	0.13	0.32
Education 8 or fewer years	0.26	0.25	0.87
Education between 9 and 11 years	0.20	0.18	0.60
Education 12 years	0.40	0.36	0.14
Education more than 12 years	0.14	0.21	0.01
Years of education	10.58	10.80	0.30
Employed	0.72	0.71	0.42
Labor income (in thousand pesos)	168.97	166.68	0.65
Has a contract	0.48	0.47	0.58
Fonasa A	0.31	0.32	0.85
Fonasa B	0.32	0.27	0.30
Fonasa C	0.25	0.28	0.33
Fonasa D	0.12	0.12	0.87
OHIP score	35.88	36.16	0.57
Rosenberg score	17.46	17.35	0.40
Number of missing teeth	10.81	10.52	0.68
Number of front missing teeth	1.41	1.49	0.44
Upper prosthetic need	0.94	0.94	0.72
Lower prosthetic need	0.93	0.92	0.52
F-test (p-value)			0.73
Observations	350	449	
Panel B. First follow-up			
Age	48.41	47.85	0.79
Gender	0.73	0.71	0.42
Married or cohabitates	0.58	0.57	0.66
Head of household	0.77	0.72	0.12
Number of residents at home	4.31	4.30	0.90
Residents under 5 years at home	0.31	0.36	0.48
Residents between 5 and 18 years at home	1.15	1.18	0.65
Adults at home	2.67	2.68	0.92
Residents over 65 years at home	0.18	0.13	0.23
Education 8 or fewer years	0.25	0.23	0.72
Education between 9 and 11 years	0.20	0.19	0.71
Education 12 years	0.40	0.37	0.25
Education more than 12 years	0.14	0.21	0.02
Years of education	10.58	10.89	0.18
Employed	0.71	0.70	0.49
Labor income (in thousand pesos)	166.30	166.49	0.77
Has a contract	0.47	0.47	0.70
Fonasa A	0.31	0.33	0.49
Fonasa B	0.32	0.27	0.21
Fonasa C	0.25	0.28	0.49
Fonasa D	0.12	0.11	0.86
OHIP score	35.61	36.26	0.24
Rosenberg score	17.44	17.38	0.25
Number of missing teeth	10.98	10.47	0.43
Number of front missing teeth	1.47	1.44	0.91
Upper prosthetic need	0.93	0.94	0.69
Lower prosthetic need	0.93	0.92	0.60
F-test (p-value)			0.67
Observations	290	352	

(*continued*)

TABLE 2—BALANCE TESTS (*continued*)

	Treatment (1)	Control (2)	Difference (3)
Panel C. Second follow-up			
Age	48.45	48.48	0.83
Gender	0.75	0.71	0.96
Married or cohabitates	0.57	0.62	0.29
Head of household	0.80	0.71	0.00
Number of residents at home	4.32	4.32	0.90
Residents under 5 years at home	0.33	0.34	0.97
Residents between 5 and 18 years at home	1.13	1.22	0.17
Adults at home	2.69	2.70	0.84
Residents over 65 years at home	0.17	0.12	0.09
Education 8 or fewer years	0.23	0.25	0.62
Education between 9 and 11 years	0.21	0.18	0.54
Education 12 years	0.42	0.36	0.18
Education more than 12 years	0.15	0.20	0.07
Years of education	10.71	10.79	0.67
Employed	0.71	0.69	0.65
Labor income (in thousand pesos)	165.89	161.65	0.62
Has a contract	0.46	0.46	0.90
Fonasa A	0.30	0.34	0.51
Fonasa B	0.33	0.26	0.07
Fonasa C	0.26	0.29	0.28
Fonasa D	0.11	0.11	0.89
OHIP score	35.52	36.61	0.27
Rosenberg score	17.41	17.27	0.39
Number of missing teeth	11.27	10.72	0.24
Number of front missing teeth	1.59	1.51	0.63
Upper prosthetic need	0.94	0.95	0.66
Lower prosthetic need	0.94	0.93	0.95
F-test (*p*-value)			0.25
Observations	248	299	

Notes: This table presents averages for treatment and control groups at baseline and in the two follow-ups. The table also presents the *p*-value for a test of the difference in means between the treatment and control groups for each variable in each sample, after controlling for strata fixed effects. The table also presents the *p*-values for the *F*-test that accounts for joint orthogonality of balance variables to the treatment in each sample.

group compared to 21 percent in the control group).[20] Consistently, an *F*-test of the joint significance of all variables in predicting treatment status indicates that it is not possible to reject the null hypothesis that the variables at baseline are uncorrelated with treatment status (*p*-value of 0.73).

In Table 2 we also observe attrition rates of 19.6 percent and 31.5 percent for the first and second follow-ups, respectively. The attrition rate in the first follow-up was 17.1 percent for the treatment group and 21.6 percent for the control group. However, this difference is not statistically significant (*p*-value of 0.17). This pattern is also present in the second follow-up with an attrition rate of 29.1 percent in the treatment group and 33.4 percent in the control group. Again, the difference is not statistically significant (*p*-value of 0.27).

Panels B and C of Tables 1 and 2 report the descriptive statistics in the first and second follow-ups. We do not observe relevant changes over time in sample

[20] Notice, however, that there is no statistical difference between the treatment and control groups in average years of education.

composition. Panel B of Table 2 presents differences between the control and treatment groups in the first follow-up. Again, we observe a significantly higher percentage of individuals in the control group who have more than 12 years of education (14 percent compared to 21 percent). The imbalance at baseline regarding the fraction of individuals who are heads of households is also noticeable; however, this time it is not statistically significant. The *F*-test for the overall significance of variables in explaining treatment status indicates that we cannot reject the null hypothesis of no correlation (*p*-value of 0.67).

Finally, panel C of Table 2 shows the differences between the treatment and control groups in the second follow-up. Again, we observe a significantly higher percentage of individuals in the treatment group who are heads of household (80 percent versus 71 percent). However, minor differences also appear in one of the FONASA categories (33 percent of individuals in plan B in the treatment group compared to 26 percent in the control group), among household members over 65 years (0.17 individuals in the treatment group compared to 0.12 in the control group), and in the category of more than 12 years of education (15 percent of individuals in the treatment group compared to 20 percent in the control group). Still, the *F*-test suggests an overall balance (*p*-value of 0.25).

All in all, our reading of these results is that there are no systematic differences between the treatment and control groups in most of the relevant variables.[21] Therefore, the main cost of attrition is sample size and a lower-powered experiment, especially for the second follow-up.

D. *Statistical Methods*

The random assignment of treatment across eligible applicants allows us to estimate the effect of offering treatment by comparing average outcomes for the treatment and control groups.

To estimate the direct impact of being offered the program (the ITT estimator), we run the following OLS regression:

$$Y_i = \alpha + \beta T_i + \gamma \mathbf{X}_i + \epsilon_i, \tag{1}$$

where Y_i is the outcome of interest for individual i, T_i is a dummy variable that equals 1 if the person was offered the program, and β captures the impact of the program. $\mathbf{X}_i$ is a set of control variables that includes years of education, head of household status, the dependent variable at baseline, and dummies for the randomization strata.[22] Given that treatment assignment is random, β should not change when including control variables; we add them to increase precision. We report both

[21] Online Appendix Table 1 presents the correlates of participation in both follow-up surveys. Only one variable in the first follow-up (head of household) and one in the second (household members between 5 and 18 years) are statistically significant. In addition, the global significance tests suggest no correlation between the variables and participation in the surveys. Still, we reestimated treatment effects using inverse probability weighting to study the robustness of our results to attrition. See the results in online Appendix Table 3.

[22] We include the first two because they are unbalanced at baseline.

robust standard errors of the coefficients and the *p*-values corrected for multiple hypothesis testing following Romano and Wolf (2005a, b, 2016).

We perform several additional exercises. First, we report results for the complete sample and by gender. Second, we estimate the effects for each follow-up, also testing whether treatment effects differ statistically across gender and follow-ups. Third, we present estimates using inverse probability weighting to study the potential impact of attrition on our results. Fourth, we offer estimates using IV regressions to identify whether changes in the effects through time may be due to changes in take-up of dental services across the treatment and control groups. We use the OHIP score as the endogenous variable and instrument it using the ITT dummy T_i .[23] Finally, we explore the existence of heterogeneous effects on primary outcomes by the number of front and non-front missing teeth at baseline.

III. Results

In this section, we present the main results of the estimation of treatment effects. First, we report the impact on use of dental services. Next, we present treatment effects on objective and subjective dental health outcomes. Finally, we present the estimates of impact on physical and mental health and psychological, social, and economic outcomes in both follow-ups.

A. *Use of Dental Services*

Table 3 presents our findings on all participants' self-reported use of dental services, considering different definitions of use. We first report the impact on the probability of receiving treatment. This effect equals 65 percentage points (pp, hereafter); that is, about two-thirds of people offered treatment actually completed it.[24] Women are more likely to complete treatment than men (67 pp versus 57 pp), and the difference across gender is statistically significant (column 7).

However, as previously noted, people in the control group also use dental services outside the program. We study the effect on two dimensions of use to account for this. First, we consider the extensive margin: the probability of receiving any dental service in the year before each follow-up. Table 3 shows that the effect on the likelihood of having received any dental service is 16 pp in the first follow-up and 6 pp in the second. That is, a significant share of the individuals in our experiment uses essential dental services. This possibly relates to the fact that participants are

[23] We estimate the following equation:

$$Y_i = \alpha + \beta^{IV} OHIP_i + \gamma \mathbf{X}_i + \epsilon_i, \tag{2}$$

where all the variables are as in equation (1) except for $OHIP_i$, which is the OHIP score. Regarding exclusion restrictions, we recognize that the program may have affected outcomes above and beyond the OHIP. Therefore, we interpret the effect of *OHIP* as the overall effect of the program on outcomes.

[24] In online Appendix Table 2, we analyze the correlates of program completion. We find that baseline variables are not jointly statistically correlated with treatment take-up. Only FONASA categories are significant for the entire sample.

Table 3—Take-up of Dental Services

	All		Men		Women		H_0: *No gender effects*
	Mean (control) (1)	Difference (2)	Mean (control) (3)	Difference (4)	Mean (control) (5)	Difference (6)	*p*-value (7)
Panel A. First follow-up							
Completed treatment	0.00	0.65 (0.03) [0.00]	0.00	0.57 (0.05) [0.00]	0.00	0.67 (0.03) [0.00]	0.07
Observations		799		238		561	
Received any dental service	0.49	0.16 (0.04) [0.00]	0.41	0.20 (0.07) [0.01]	0.53	0.13 (0.04) [0.00]	0.89
Observations		642		180		462	
Wears a dental prosthesis during the survey	0.30	0.45 (0.04) [0.00]	0.25	0.55 (0.06) [0.00]	0.32	0.41 (0.04) [0.00]	0.06
Observations		641		181		460	
Panel B. Second follow-up							
Received any dental service	0.84	0.06 (0.03) [0.04]	0.78	0.09 (0.07) [0.48]	0.87	0.03 (0.03) [0.15]	0.42
Observations		547		150		397	
Wears a dental prosthesis during the survey	0.34	0.29 (0.04) [0.00]	0.38	0.25 (0.09) [0.07]	0.33	0.32 (0.05) [0.00]	0.46
Observations		547		150		397	
Panel C. Test of differences across surveys (p-values)							
Received any dental service		0.00		0.05		0.02	
Wears a dental prosthesis during the survey		0.00		0.00		0.00	

Notes: This table presents treatment effects for different definitions of take-up of dental services. All regressions include controls for strata fixed effects and the following baseline variables: OHIP score, Rosenberg score, employment status, years of education, and a dummy for being the head of household. Robust standard errors are reported in parentheses. *p*-values robust to multiple hypothesis testing following Romano and Wolf (2005a, 2005b, 2016) are in square brackets. Differences in the number of observations among the variables measured in panel A arise because (i) the measurement of the take-up of the treatment comes from administrative data (and therefore includes information for the 799 subjects included in the experiment), (ii) the variables to measure demand for dental services and the use of a prosthesis come from the sample of people who participated in the second follow-up, and (iii) differences between the samples for the two variables arise from the fact that more people have valid answers to construct the second variable.

individuals with dental problems. We do not find statistically significant differences across gender in the extensive margin.

Second, we consider the impact of the intervention on the intensive/quality margin of use of dental services, that is, the probability of wearing dental prostheses at each follow-up. Results imply that the effect on the likelihood of wearing prostheses is 45 pp at the first follow-up and 29 pp at the second. The effect is large but somewhat attenuated by the fact that 30 percent and 34 percent of subjects in the control group report wearing prostheses in each respective follow-up.

We also study whether prosthesis use varies across gender. We find that the effect of the program on prosthesis use is higher for men than for women in the first follow-up (55 pp versus 41 pp), but the pattern reverses in the second follow-up (32 pp for women versus 25 pp for men, but this difference is not statistically significant). This smaller effect for men in the second follow-up is partly due to increased take-up in the control group between follow-ups (from 25 percent to 38 percent; the increase for women is much smaller, from 32 percent to 33 percent). Between follow-ups, prosthesis use in the treatment group fell, with a greater fall for men (from 80 percent to 63 percent for men versus from 73 percent to 65 percent for women). The results in panel C imply that the impact on dental use decreases significantly for both genders in the second follow-up. Considering this decrease in take-up is essential when analyzing the program's impact across the two follow-ups and interpreting the results. With this in mind, our IV estimates below take into account changes in dental health across surveys.

In sum, our results suggest that people who were offered treatment improved their use of services. However, the impact varies across gender and through time, partly due to changes in take-up by the control group.

B. *Oral Health and Smiling Behavior*

Table 4 presents our findings for dimensions related to dental health. Panel A shows impacts on the results of the dental examination performed in the first follow-up. We use two measures: the number of teeth with untreated cavities and the number needing dental treatment. Both margins intend to capture whether treatment objectively improved dental health. We find significant effects in favor of the treatment group in both dimensions. Treated individuals have 1.2 fewer teeth with untreated cavities (equivalent to 0.34 standard deviations, σ hereafter) and 3.5 fewer teeth in need of treatment (0.79σ). Consistent with the evidence for prostheses, we find stronger effects for men: men in the treatment group have 1.6 fewer teeth with cavities and 5.1 fewer teeth in need of treatment versus 0.9 and 3.1, respectively, for women. However, only differences in the number of teeth with cavities are statistically significant across gender.

Panel B of Table 4 presents effects on self-perceived oral health in the first follow-up. The treatment effects are very large (0.87σ).[25] As previously discussed, the OHIP score captures self-perceptions of oral health-related quality of life. Given its scope and the fact that it captures perceptions of dental health status, it is not surprising that the estimated impact is stronger than for objective measures. In terms of gender heterogeneity, in contrast to results for the objective measures, we find that estimated treatment effects are slightly larger for women than for men, though the difference is statistically insignificant.

Panel C shows that treatment effects decrease but are still large and statistically significant three years after treatment (0.65σ). The reduction in impact reflects an

[25] This variable is standardized relative to the control group in the first follow-up.

Table 4—Treatment Effects on Dental Health Outcomes

	All		Men		Women		H_0: *No gender effects*
	Mean (control) (1)	Difference (2)	Mean (control) (3)	Difference (4)	Mean (control) (5)	Difference (6)	*p*-value (7)
Panel A. First follow-up							
Number of teeth with cavities	2.01	−1.15 (0.15) [0.00]	2.88	−1.63 (0.39) [0.00]	1.66	−0.91 (0.16) [0.00]	0.08
Observations		642		180		462	
Number of teeth in need of dental treatment	23.53	−3.47 (0.72) [0.00]	24.63	−5.05 (1.57) [0.00]	23.08	−3.10 (0.85) [0.00]	0.26
Observations		642		180		462	
Panel B. Subjective measures of dental health, first follow-up survey							
Subjective oral health (*OHIP*)	−0.00	0.87 (0.08) [0.00]	0.19	0.73 (0.16) [0.00]	−0.08	0.93 (0.09) [0.00]	0.28
Observations		642		180		462	
Panel C. Subjective measures of dental health, second follow-up survey							
Subjective oral health (*OHIP*)	0.45	0.65 (0.09) [0.00]	0.63	0.69 (0.18) [0.00]	0.37	0.66 (0.11) [0.00]	0.88
Observations		547		150		397	
Panel D							
Smiling behavior	0.43	0.09 (0.04) [0.06]	0.32	−0.05 (0.07) [0.81]	0.46	0.15 (0.05) [0.00]	0.02
Observations		527		145		382	
Panel E. Test of differences across surveys (*p*-values)							
Subjective oral health (*OHIP*)		0.00		0.10		0.00	

Notes: This table presents treatment effects for different measures of dental health in the first and second follow-up surveys. All regressions include controls for strata fixed effects and the following baseline variables: OHIP score, Rosenberg score, employment status, years of education, and a dummy for being the head of household. Robust standard errors are reported in parentheses. *p*-values robust to multiple hypothesis testing following Romano and Wolf (2005a, 2005b, 2016) are in square brackets. Panel E presents *p*-values for tests of differences of treatment effects across the first and second follow-up surveys. Differences in the number of observations among the variables measured in panels A and B (both coming from the first follow-up survey) arise because the variables included in panel A have more missing values than the answers in the questionnaire needed to construct the OHIP index. In turn, panel C includes observations from subjects who participated in the second follow-up. Finally, observations used in the regressions reported in panel D come from individuals with photographs from the first follow-up.

important increase in the OHIP score for the control group. As in the first follow-up, we do not observe gender differences in the OHIP score.

Finally, panel D presents estimated effects on what we call "smiling behavior" based on the photographs taken in the first follow-up. Our measure is a dummy that captures whether the person is smiling showing teeth. We see this measure as directly related to the intervention: whether it affects how people pose for photographs. The treatment effect is 9 pp compared to the 32 percent average in the control group. However, the

results are entirely driven by a 15 pp impact for women and a null effect for men. Thus, treatment increases the probability of women displaying improvements in their dental health, which in many cases entails a new smile, but has no impact for men.

In sum, the estimation results show a large and positive impact on dimensions related to objective and subjective oral health. The effect is smaller but still significant in the second follow-up. Moreover, treatment also impacts how women pose for photographs. We find, however, no effect on men's smiling behavior.

C. *Self-Esteem*

We now present the results for the Rosenberg Self-Esteem Scale. Panel A of Table 5 shows that treatment had a large positive effect on self-esteem (0.23σ) in the first follow-up.[26] However, this is a combination of a significant effect of 0.36σ for women and a null effect for men. In the second follow-up, the average impact decreases to 0.17σ (panel B). Again, this effect is fueled by a significant 0.23σ impact for women and a null effect for men, though gender differences are not statistically significant in the second follow-up. In addition, results in panel C imply that we cannot reject that the impacts in the first and second follow-ups are equal. Thus, our results suggest a large and persistent impact on self-esteem, but only for women—a result reinforced by the IV estimates we present in Section IIIG. We conjecture that good oral health and an attractive smile are significantly more important for women because of economic, psychological, cultural, and social reasons, consistent with results in Table 4 of treatment effects on smiling behavior.

D. *Health Outcomes*

Next, we present the SF-12 self-perceived physical and mental health score results from the second follow-up survey.[27] Panel B of Table 5 reveals a positive but statistically insignificant effect on physical health-related quality of life (0.12σ). To the contrary, the impact on mental health is large and statistically significant (0.24σ), which is of the same order of magnitude as the impact on self-esteem. However, the mental health impact does not vary across gender, which implies that the mechanisms through which treatment affects self-esteem and perceived mental health are different. This finding is consistent with the previous literature on self-esteem and psychological welfare (e.g., Haushofer and Shapiro 2016).

E. *Labor Market Outcomes*

We now discuss treatment effects on labor market outcomes. We begin estimating the intervention's effects on employment rates, that is, on the extensive margin. Panel A of Table 5 shows an ITT effect on employment rates of about 5 pp in the first follow-up. The impact is slightly larger (7 pp) and statistically significant only

[26] This variable is standardized relative to the control group in the first follow-up.
[27] These variables are standardized relative to the control group.

Table 5—Treatment Effects on Psychological, Social, Economic, and Health Outcomes

	All		Men		Women		H_0: *No gender effects*
	Mean (control) (1)	Difference (2)	Mean (control) (3)	Difference (4)	Mean (control) (5)	Difference (6)	*p*-value (7)
Panel A. First follow-up							
Self-esteem (*Rosenberg test*)	−0.00	0.23	0.39	−0.06	−0.16	0.36	0.00
		(0.07)		(0.12)		(0.09)	
		[0.00]		[0.85]		[0.00]	
Observations		634		178		456	
Employed	0.78	0.05	0.94	0.01	0.72	0.07	0.28
		(0.03)		(0.03)		(0.04)	
		[0.18]		[0.94]		[0.06]	
Observations		642		180		462	
Log of earnings (*if working at baseline*)	9.60	0.74	11.88	0.07	8.69	1.00	0.14
		(0.35)		(0.42)		(0.46)	
		[0.06]		[1.00]		[0.03]	
Observations		539		168		371	
Panel B. Second follow-up							
Self-esteem (*Rosenberg test*)	0.21	0.17	0.42	0.03	0.12	0.23	0.20
		(0.08)		(0.13)		(0.09)	
		[0.14]		[0.95]		[0.05]	
Observations		539		148		391	
Physical health (SF-12)	−0.00	0.12	0.37	0.07	−0.16	0.13	0.87
		(0.08)		(0.15)		(0.10)	
		[0.62]		[0.95]		[0.27]	
Observations		547		150		397	
Mental health (SF-12)	0.00	0.24	0.33	0.29	−0.14	0.24	0.60
		(0.08)		(0.14)		(0.10)	
		[0.06]		[0.48]		[0.06]	
Observations		547		150		397	
Employed	0.81	0.01	0.94	0.00	0.76	0.01	0.88
		(0.03)		(0.03)		(0.04)	
		[0.91]		[0.95]		[0.82]	
Observations		547		150		397	
Log of earnings (*if working at baseline*)	9.87	0.17	11.98	0.34	8.97	0.18	0.82
		(0.39)		(0.46)		(0.54)	
		[0.89]		[0.88]		[0.78]	
Observations		460		145		315	
Panel C. Test of differences across surveys (*p-values*)							
Self-esteem (*Rosenberg test*)		0.27		0.77		0.24	
Employment rate		0.20		0.81		0.13	
Log of earnings (*if working at baseline*)		0.24		0.64		0.15	

Notes: This table presents estimated treatment effects on outcome variables in the first and second follow-ups. All regressions include controls for strata fixed effects and the following baseline variables: the dependent variable (we use the Rosenberg score for the physical and mental health regressions, as we do not have those variables measured at baseline), years of education, and a dummy for being the head of household. Robust standard errors are reported in parentheses. *p*-values robust to multiple hypothesis testing following Romano and Wolf (2005a, 2005b, 2016) are in square brackets. Panel C presents *p*-values for tests of differences of treatment effects across the first and second follow-ups. Differences in the number of observations for the regressions reported in panel A arise because (i) we have more missing values for the Rosenberg scale than for employment and (ii), as mentioned in the table, regressions for earnings only include people working at baseline. The same happens in panel B, where we have more missing values for the Rosenberg scale than for the other variables included and again, log earnings only include observations for people working at baseline.

for women. The impact size is noteworthy given that women in our experiment have high employment rates at baseline and that employment outcomes depend on market equilibrium.[28]

These impacts decrease and become statistically insignificant for the second follow-up. That is, the effect of access to prostheses only has a short-term effect on the extensive margin despite the persistent impact on oral health and self-esteem. However, results in panel C of Table 5 suggest that due to the imprecision of the estimates, we cannot reject that the effects are constant across surveys.

Interestingly, panel A of Figure 1 shows that the decrease in treatment effects is related to increases in the employment rate of women in the control group and not to reductions in the employment rate of the treatment group. Consistent with this finding, panel B shows a positive trend in Chile's overall female employment rate using data from the Ministry of Social Development and Family (2015), which reports employment rates for men and women for 2009, 2011, 2013, and 2015 using data collected in the CASEN surveys for these years. Thus, these results suggest that treatment may have accelerated women's access to employment opportunities without changing their medium-term prospects. Alternatively, the fading out could be due to increased access to dental care in the control group and wear and tear of the provided services. We test this hypothesis in Section IIIG based on our IV estimates.

Next, we study the program's effects on log earnings for subjects working at baseline. Results show a significant ITT effect of 74 log points for the entire sample. However, as in the case of self-esteem and employment rates, results show that the effect is statistically significant and economically relevant only for women. Again, the impacts decrease in the second follow-up, and the low precision of the estimates means that we cannot reject the hypothesis that the effects are equal across surveys.

In sum, the results suggest that oral health status impacts labor market outcomes, at least in the short term for women. We confirm this result with the IV estimates we present below, which take into account changes in dental health status across surveys. In addition, in Section IV we allow for heterogeneity to understand the potential mechanisms behind these effects.

F. *Other Outcomes*

Finally, we study the impact of treatment on additional outcomes in Table 6. The analyses intend to capture additional dimensions that may be affected by the intervention, including investments that complement improved dental health, the quality of intra-household relationships, and appearance ratings.

Complementary Investments.—The second follow-up includes questions that help us understand whether the improvements in appearance and dental health led subjects to invest additional time, money, and effort in complementary investments. We

[28] Note also that the reduction in the sample size due to nonselective attrition implies that we may not have enough statistical power to identify small effects, which may be particularly relevant for men. However, we do not find relevant changes in most results when using an inverse probability weighting approach to study the effects of attrition on treatment effects. See online Appendix Table 3.

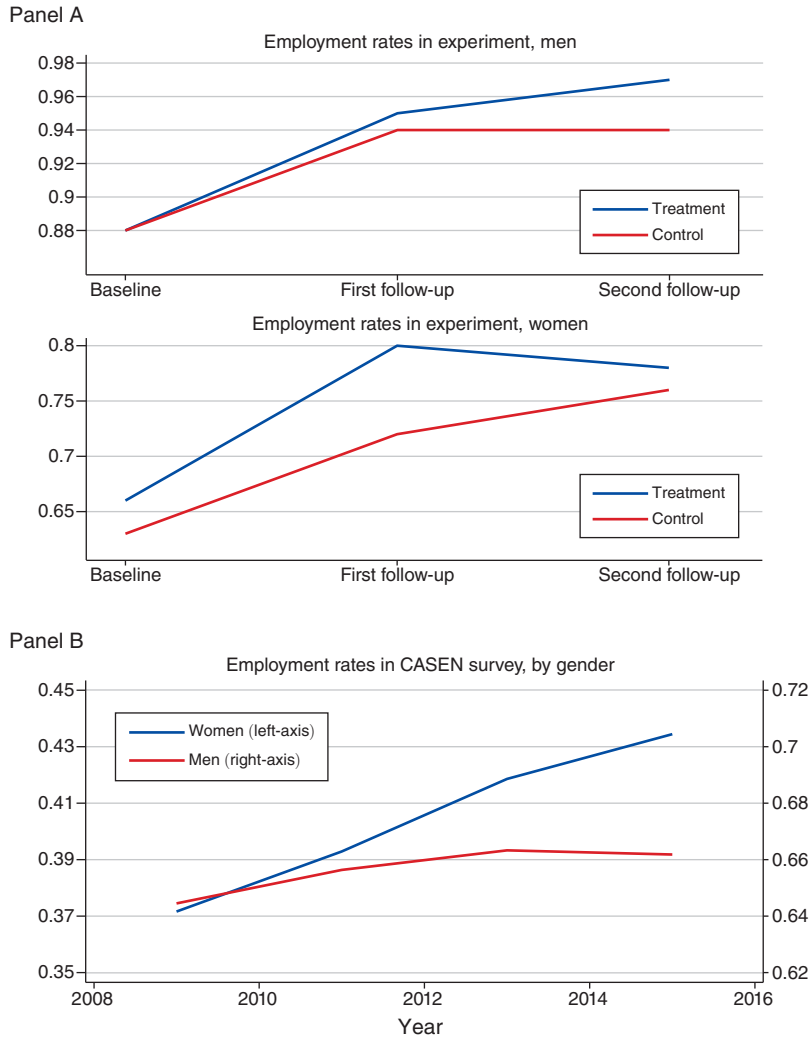

FIGURE 1

Notes: Data in Panel A come from the experiment. Data for panel B come from page 13 of the Ministry of Social Development and Family (2015), which reports employment rates for men and women for 2009, 2011, 2013, and 2015 using data collected in the CASEN surveys for these years.

measured changes to: hair (cut, color, or style); diet and exercise; and spending on clothing, personal care items, and cosmetic treatments. We define dummy variables indicating whether individuals invested more in each item and study the effects on their sum. We find ITT effects of 0.56 from an average of 3.34 for the control group. Interestingly, we do not see differences across gender, which suggests that the effects are not driven by the impacts on self-esteem or income, which tend to be stronger for women.[29]

[29] We find relevant impacts on several individual items for men and women. The most important impacts relate to spending on personal care items, makeup, clothing, accessories and ornaments, and hair. See online Appendix Table 5.

Table 6—Effects on Additional Outcomes

	All		Men		Women		H_0: *No gender effects*
	Mean (control) (1)	Difference (2)	Mean (control) (3)	Difference (4)	Mean (control) (5)	Difference (6)	*p*-value (7)
Complementary investments	3.34	0.56 (0.18) [0.01]	2.88	0.63 (0.43) [0.48]	3.53	0.57 (0.21) [0.04]	0.90
Observations		547		150		397	
Quality of interactions with partner	5.01	0.48 (0.15) [0.02]	5.37	−0.11 (0.27) [0.95]	4.81	0.66 (0.19) [0.00]	0.02
Observations		341		117		224	
Appearance (*rating of pictures*)	−0.00	0.12 (0.09) [0.18]	0.04	−0.04 (0.14) [0.84]	−0.01	0.21 (0.10) [0.06]	0.15
Observations		527		145		382	

Notes: This table presents estimated treatment effects for additional outcomes. All regressions include controls for strata fixed effects and the following baseline variables: OHIP score, Rosenberg score, employment status, years of education, and a dummy for being the head of household. Robust standard errors are reported in parentheses. *p*-values robust to multiple hypothesis testing following Romano and Wolf (2005a, 2005b, 2016) are in square brackets. Differences in sample size arise because data for the first two values come from subjects who participated in the second follow-up and data for the third variable come from individuals with photographs from the first follow-up.

Interactions with Partner.—We also study the treatment's effect on outcomes related to the quality of intra-household relationships using questions from the second follow-up. Specifically, we asked whether individuals: (i) went out with their partners, (ii) received gifts from their partners, (iii) gave gifts to their partners, (iv) had serious arguments with their partners, (v) were forbidden by their partners from any particular activity, (vi) suffered verbal abuse from their partners, and (vii) suffered physical abuse from their partners. We created dummy variables for each dimension based on their positive aspects and added them to create a single index. We find ITT effects of 0.48 from an average of 5.01 for the control group.[30] These effects are driven by a significant impact only on women.[31]

Appearance Ratings by Others.—We also study treatment effects on observer perceptions of appearance using the instrument developed by Eli et al. (2001) and Kershaw et al. (2008). It is worth noting that curricula vitae (CVs) with photographs are extensively used in Chile and other emerging countries (Marlowe et al. 1996; López Bóo et al. 2013). Moreover, previous research demonstrates how "first impressions" affect the perception of others' traits (Willis and Todorov 2006; Todorov et al.

[30] We only asked these questions to those who had a partner. Given that we do not find effects on the extensive margin of the marriage market, these results thus capture effects on the quality margin.

[31] The most substantial impacts are on giving gifts, having serious arguments, not being forbidden by partners to activities, and suffering verbal abuse. Results are presented in online Appendix Table 5.

2005). Thus, we use photographs to measure the impact of a change in appearance on observer perceptions.

Table 6 presents treatment effects after standardizing ratings relative to the control group. The effect for the complete sample is 0.12σ, but it is not statistically significant. However, the effects differ significantly by gender, with the impact for men close to 0 and the impact for women equal to 0.21σ and statistically significant.[32] Recall from Table 4 that treated women were more likely to smile in photographs. Thus, these results are consistent with appearance's effects being different for women than for men.

G. *Robustness Exercises*

We now discuss two robustness exercises. First, in online Appendix Table 3, we present treatment effects using inverse probability weighting to account for differential attrition rates. While attrition does not significantly differ by treatment status, it is 3–5 pp lower in the treatment group (Table 2). The results confirm the pattern presented in the main exercises, with some exceptions due to changes in the precision of the estimates.

Second, we analyze why some of the estimated effects fade out in the second follow-up. More precisely, we investigate to what extent changes in dental status across follow-ups can explain diminished effects. To better understand our results, online Appendix Table 4 presents IV estimates using the OHIP score as the endogenous variable affected by treatment. For both follow-ups, IV estimates confirm the patterns identified using the ITT approach in terms of differences across gender (with IV estimates that tend to be more precise). Interestingly, in the case of the Rosenberg score, the differences across surveys seem to be much smaller than those in the ITT estimates. For instance, while the ITT estimate for the Rosenberg score for women decreases 36 percent, the IV estimate decreases just 7.5 percent. This fact suggests that part of the fadeout of the ITT effects for the Rosenberg score is due to changes in dental outcomes across surveys. This result contrasts with the impact of treatment on labor market outcomes, where the decreases in IV estimates are of the same order of magnitude as those in the ITT estimates. Thus, while the estimates are imprecise, differences in dental outcomes cannot explain the fadeout effects we observe for women's labor market outcomes.

IV. Mechanisms

Our results show that treatment positively affected several outcomes, usually with stronger and more persistent impacts on women. At the same time, there are some outcomes without any economically significant differences across gender. These include physical, mental, and dental health and complementary investments. In contrast, self-esteem, smiling behavior, appearance ratings, partner relationship quality, and short-term labor market outcomes are substantially impacted only for women.

[32] Online Appendix Table 5 shows that the effect is strongest on perceptions of psychological adjustment and social competence.

It is unlikely that income effects explain these patterns because we do not see persistent impacts on labor market outcomes for women. In addition, we observe an effect on complementary investments among men who, at the same time, show no significant income effects.

In our research funding proposal prior to implementation of the first follow-up, we intended to study heterogeneity only by gender.[33] However, our results led us to expand it to additional dimensions, mainly how baseline levels of visible and nonvisible dental problems affect the program's impact. We are interested in identifying the role of two potential mechanisms through which improved dental health may affect these outcomes. First, we consider the nonvisible component of dental health due to missing non-front teeth. Second, we examine dental health's visible component due to missing front teeth. To measure the dental treatment's nonvisible component, we created two dummies indicating whether the subject has many missing non-front teeth. The first dummy measures whether the individual is missing more than nine non-front teeth, which corresponds to the median of the distribution of missing non-front teeth in our sample. The second dummy indicates missing more than 12 non-front teeth, or the seventy-fifth distribution percentile. Similarly, we created two dummies to measure the visible component of oral health. One indicates whether the subject is missing at least one front tooth (i.e., more than the median), and the other indicates missing at least two front teeth (i.e., above the seventy-fifth percentile). We use two thresholds to analyze the relevance of the intensity of dental issues.

Tables 7 and 8 present the results, pooling the first and second follow-ups (i.e., assuming the impacts are constant, as suggested by previous results). We begin by analyzing the results for women. Women with the most considerable treatment effects on their OHIP scores are missing more front and non-front teeth at baseline than the median. In contrast, regarding the Rosenberg score, treatment effects are stronger only for women missing many non-front teeth. However, for the OHIP and Rosenberg scores, the effects do not seem more substantial for women having the most intense dental issues at baseline (i.e., comparing the results for women above the seventy-fifth percentile versus those above the median). Next, regarding earnings, the impact is larger and more significant for women with the most intense visible problems at baseline (comparing women above the two different thresholds). Finally, the results for employment point in the same direction but are not precisely estimated. In turn, the effects of missing non-front teeth are smaller.

Interestingly, the results for men are not statistically significant by and large. We only find differential effects on the OHIP scores of men missing front teeth at baseline (using both dummies) and the Rosenberg score (using the one missing teeth dummy). We do not find effects of the visible component on men's labor market outcomes. We hypothesize that the mechanisms through which the visible components of dental health affect labor market outcomes are relevant only for women. In contrast, we find evidence that more intense nonvisible dental problems produce stronger labor market effects (using the seventy-fifth percentile threshold) for men.

[33] FONDECYT Project #1120539.

Table 7—Heterogeneity Analysis: Subjective Oral Health and Self-Esteem

Dependent Variable	OHIP			Rosenberg		
Interaction of treatment with dummy for:	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Women						
Missing at least one front tooth	0.42		−0.02	0.07		0.25
	(0.21)		(0.43)	(0.17)		(0.31)
Missing at least two front teeth		0.28			0.10	
		(0.22)			(0.18)	
Missing many non-front teeth (*above median*)	0.45			0.41		
	(0.20)			(0.17)		
Missing many non-front teeth (*above percentile 75*)		0.26			0.05	
		(0.24)			(0.18)	
Panel B. Men						
Missing at least one front tooth	0.84		2.11	0.57		1.51
	(0.33)		(0.61)	(0.26)		(0.38)
Missing at least two front teeth		0.69			0.29	
		(0.37)			(0.28)	
Missing many non-front teeth (*above median*)	−0.23			−0.07		
	(0.35)			(0.31)		
Missing many non-front teeth (*above percentile 75*)		−0.20			0.00	
		(0.42)			(0.31)	
Control for interactions of treatment with total and front missing teeth	No	No	Yes	No	No	Yes

Notes: This table presents estimated interactions of the treatment with the relevant variable. All regressions include the main effects of treatment and the variables with coefficients reported in the table and controls for strata fixed effects and the following baseline variables: the dependent variable, years of education, and a dummy for being the head of household. Columns 3 and 6 also include the number of total and missing front teeth and interactions of these two variables with the treatment. Robust standard errors are reported in parentheses.

We perform an additional exercise to study the role of missing one front tooth in the spirit of a regression discontinuity design. That is, we estimate a regression with an interaction of treatment and the dummy for having at least one missing front tooth while controlling for interactions of treatment and the number of missing front and non-front teeth. This estimator captures the effect of treatment for people missing one front tooth (i.e., missing a smile). The results confirm previous findings: estimates for labor market outcomes are positive only for women, and both estimators are statistically significant. In contrast, also consistent with previous results, we find significant effects only on the OHIP score for men.

In sum, these estimates suggest a pattern in which visible components of dental health are relevant for labor market outcomes, especially for women. Moreover, the fact that we do not find similar patterns for other outcomes or men suggests that appearance has a more relevant role for labor market outcomes for women than for men.

V. Conclusions

Poor people face the challenges of living with poor dental health and its economic, psychological, and social consequences. These challenges seem to be even more burdensome for poor women, especially if their appearance is affected. This paper examines the effects of improving oral health, emphasizing dental appearance.

Table 8—Heterogeneity Analysis: Labor Market Outcomes

Dependent Variable	Employment			Log of income		
Interaction of treatment with dummy for:	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Women						
Missing at least one front tooth	0.07		0.21	1.39		2.50
	(0.08)		(0.12)	(0.96)		(1.50)
Missing at least two front teeth		0.10			1.91	
		(0.09)			(1.12)	
Missing many non-front teeth (*above median*)	0.02			0.74		
	(0.07)			(0.94)		
Missing many non-front teeth		0.06			0.92	
(*above percentile 75*)		(0.09)			(1.17)	
Panel B. Men						
Missing at least one front tooth	−0.07		−0.09	−0.89		−1.04
	(0.05)		(0.10)	(0.69)		(1.18)
Missing at least two front teeth		−0.13			−1.24	
		(0.08)			(1.00)	
Missing many non-front teeth (*above median*)	0.04			0.37		
	(0.06)			(0.71)		
Missing many non-front teeth		0.12			1.60	
(*above percentile 75*)		(0.07)			(0.94)	
Control for interactions of treatment with total and front missing teeth	No	No	Yes	No	No	Yes

Notes: This table presents estimated interactions of the treatment with the relevant variables. All regressions include the main effects of treatment and the variables with coefficients reported in the table and controls for strata fixed effects and the following baseline variables: the dependent variable, years of education, and a dummy for being the head of household. Columns 3 and 6 also include the number of total and missing front teeth and interactions of these two variables with the treatment. Robust standard errors are reported in parentheses.

We designed a randomized experiment to test whether several economic, social, and psychological outcomes responded to the provision of a private program aimed at improving dental health for poor people in Chile. A key component was to supply prostheses, which have significant and visible effects on oral health and appearance. The sample comprises eligible people who applied to the program in 2011. Participants were mainly middle-aged women with a high prevalence of clinically assessed oral health problems and limited access to quality dental health services. We conducted three detailed surveys: at baseline and at one and three years after treatment.

Our results show that the program led to statistically significant and persistent improvements in objective and subjective oral health status for both men and women. Women's self-esteem improved in both follow-ups. In contrast, women's labor market outcomes only improved in the short run. However, average treatment effects on labor market outcomes for the second follow-up are not precisely estimated. We find no impact on men's self-esteem or labor market outcomes.

We also find that the strongest effects on labor market outcomes are observed among women with appearance-related dental issues. This result suggests that the new smiles provided by the prostheses and the resulting improved oral health may drive some of these results. This conclusion is reinforced when analyzing the patterns of effects on other outcomes. For instance, treatment improved the quality

of interaction with partners only for women. However, we find that treatment has gender-neutral effects on self-perceived mental and physical health. These results suggest that a general health effect or simple income effect does not explain the pattern of results we find.

Overall, our findings indicate that increasing poor women's access to dental treatments improves their economic, psychological, and social outcomes. In contrast, improving men's dental health improves health outcomes but does not have anywhere near the same overall benefits seen by women. This supports the results of previous research finding the importance of observable and psychological attributes for women's outcomes, including those related to the labor market. This is an important result for a worldwide issue, as many individuals in developing and even developed countries lack access to high-quality dental care.

Finally, we compare the size of the treatment's effects and its cost-effectiveness to other interventions in the literature. As previously mentioned, the program cost approximately US$800 (US$1,152 using the International Monetary Fund's 2012 purchasing power parity (PPP) conversion factor). Haushofer and Shapiro (2016) and Haushofer et al. (2020) provide interesting benchmarks for effects on psychological dimensions. The first paper studies the effects of unconditional cash transfers of different magnitudes (US$404 PPP versus US$1,525 PPP), while the second analyzes the individual and joint impacts of an unconditional cash transfer (worth US$1,076 PPP) and a psychotherapy program. Both papers document the significant effects of monetary transfers on self-esteem and physical and mental health. Their effects are comparable in size to those we find for women's self-esteem and mental health (about 0.20σ). Thus, the cost-effectiveness of our intervention is similar to that of Haushofer et al. (2020). However, it is worth noting that they find no impact from their psychotherapy program on psychological or other dimensions. Moreover, like in this paper, Haushofer and Shapiro (2016) do not find impacts on men. Future research can shed light on the comparison between monetary transfers and in-kind benefits like the one analyzed in this study and address interventions with similarly sized impacts for men.

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