The Impact of Being Born with Cleft and Reparative Surgery on Health and Speech Outcomes

Khatansuudal Kira Evsanaa
University of San Francisco

Introduction

- Orofacial cleft is one of the most common and treatable congenital craniofacial deformity. Often caused by lack of fissure of lip and palate during early stages of pregnancy.
- 1/700 babies are born with cleft; approximately 30% is syndromic and 70% non-syndromic (WHO, 2002).
- If left untreated, orofacial cleft can impair normal speech development, growth and could lead to a number of health complications later in life.
- Prevalence rate of orofacial cleft is higher in developing countries due to:
  1) Shortage in adequately trained medical professionals (Ghani et al., 2004)
  2) Lack of accessibility, and affordability (O'Donnell, 2007)
  3) Religious belief (Ross, 2007)

Background on Cleft
Different Types of Cleft
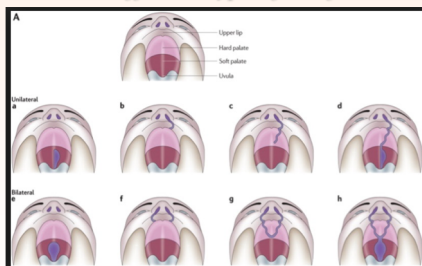
Surgical treatment may have heterogenous outcomes on health and speech depending on the cleft severity and the timing of surgery.

Methodology

Research Questions:
- What is the impact of being born with cleft on health and speech outcomes?
- What is the impact of receiving cleft surgery on health and speech outcomes?

Hypothesis:
- H_A : Being born with cleft has negative impact on overall health and speech outcomes
- H_A : Receiving cleft reparative surgery has positive impact on overall health and speech outcomes

Data:
- Study Settings: West Bengal and Andhra Pradesh region of India.
- 2 separate surveys: Parent/Guardian's and Patient-Sibling.

Control Group: Un-affected siblings to the cleft patients >=7 years of age

Treatment Group 1: *Un-operated* cleft patients between the ages of 11-19 years to measure the impact of being born with orofacial cleft

Treatment Group 2: *Partially or fully treated* cleft patients between the ages of 11-19 years to measure the impact of receiving cleft surgeries.

Counterfactual: What would happen to the treated patients in the absence of treatment?

Empirical Strategy:

Simple Difference-in-Differences model along with household fixed effects to control for time invariant characters.

- Model 1:
$$y_{ij} = \alpha + \beta C_i + \tau S_i + \omega OS_i + X'_{ij}\vartheta + \mu_i + \varepsilon_i$$
- Model 2:
$$y_{ij} = \alpha + \beta C_i + S'_i\tau + \omega OS_i + X'_{ij}\vartheta + \mu_i + \varepsilon_i$$

Overall health outcome constructed using an Anderson Index and overall speech was measured using "Universal Parameters for Reporting Speech Outcomes"(Henningson et al., 2007).

Results

Table 1: Overall Health Outcome

	(1) Overall Health	(2) Weight	(3) Height	(4) Grip Strength	(5) BMI
Cleft Severity	0.07	0.00	0.07	-0.02	-0.04
	(0.06)	(0.03)	(0.04)	(0.06)	(0.04)
Surgery Received	-0.09	-0.07	-0.11	-0.02	-0.02
	(0.15)	(0.07)	(0.12)	(0.14)	(0.17)
Operation Smile Surgery	0.44	0.15	0.11	0.24	0.24
	(0.28)	(0.19)	(0.22)	(0.25)	(0.33)
Birth Order	-0.13	-0.01	-0.03	-0.02	-0.02
	(0.16)	(0.09)	(0.12)	(0.12)	(0.14)
Age	0.115**	0.181***	0.146***	0.131***	0.160***
	(0.05)	(0.02)	(0.02)	(0.03)	(0.04)
Male	0.12	0.15	0.323**	0.650***	-0.13
	(0.21)	(0.11)	(0.15)	(0.19)	(0.18)
Constant	-1.668*	-2.745***	-2.355***	-2.225***	-2.228***
	(0.99)	(0.46)	(0.52)	(0.59)	(0.72)
N	228	228	228	228	228

Table 2: Overall Speech Outcome

	(1) Speech Acceptability	(2) Hyper-nasality	(3) Hypo-nasality	(4) Audible Air Emission	(5) Speech Understand-ability
Cleft Severity	-0.327***	0.282***	0.262***	0.190**	-0.347***
	(0.07)	(0.06)	(0.10)	(0.08)	(0.06)
Surgery Received	0.12	0.17	-0.30	0.10	0.17
	(0.21)	(0.13)	(0.28)	(0.20)	(0.22)
Operation Smile Surgery	0.10	0.11	-0.13	0.14	-0.06
	(0.29)	(0.25)	(0.36)	(0.32)	(0.30)
Birth Order	0.13	0.12	0.00	-0.10	0.16
	(0.10)	(0.10)	(0.15)	(0.13)	(0.11)
Age	0.01	0.00	-0.0265***	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Male	-0.17	-0.12	0.00	0.11	-0.30
	(0.25)	(0.22)	(0.31)	(0.29)	(0.25)
Constant	0.24	-0.892***	0.11	-0.31	0.39
	(0.36)	(0.24)	(0.44)	(0.40)	(0.36)
N	186	186	186	186	186

Table 3: Overall Health Outcome using Parental

	Overall Health	Good Health	Fitness	Trouble Feeding	Trouble Hearing	Trouble Completing Task
Cleft Severity	-0.10*	0.11	-0.06	-0.21***	-0.10*	-0.10*
	(0.05)	(0.07)	(0.07)	(0.08)	(0.05)	(0.05)
Surgery Received	0.04	0.13	0.03	-0.05	-0.13	0.10
	(0.17)	(0.21)	(0.23)	(0.24)	(0.15)	(0.11)
Operation Smile Surgery	0.14	-0.09	-0.16	0.28	0.27	0.21
	(0.29)	(0.34)	(0.31)	(0.36)	(0.27)	(0.19)
Birth Order	0.08	0.13	0.02	0.02	0.002	0.02
	(0.09)	(0.12)	(0.10)	(0.11)	(0.09)	(0.07)
Age	0.006	0.04	0.006	-0.01	-0.03	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Male	0.04	0.01	0.26	0.037	-0.16	-0.068
	(0.11)	(0.14)	(0.16)	(0.13)	(0.12)	(0.10)
Constant	-0.19	1.26*	3.55***	4.90***	5.45***	4.82***
	(0.66)	(0.74)	(0.59)	(0.71)	(0.61)	(0.50)
N	363	363	363	363	363	363

Graphs

OVERALL HEALTH BY TREATMENT GROUP AND GENDER
—Dependent Variable: Overall Health—
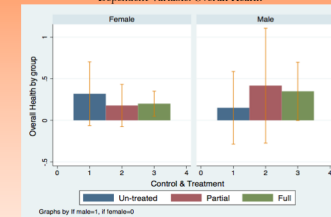
OVERALL SPEECH BY TREATMENT GROUP AND GENDER
—Dependent Variable: Overall Speech—
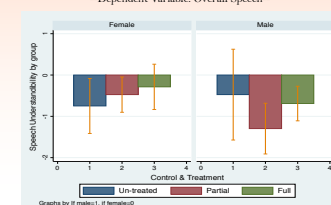
Conclusion

There is wealth literature on orofacial cleft and the impact of cleft surgery. However, the studies lack uniformity and the results are inconsistent. The results of this study suggested that both cleft and cleft surgery have no significant impact on overall health. The cleft severity has significant negative impact on overall speech outcomes but no significant impact of surgical restoration is found.

References

Ghani, S., Mannan, A., Sen, S. L., Uzzaman, M., & Harrison, M. (2004). The problems of establishing modern cleft lip and palate services in Bangladesh. *The Journal of Surgery, 2*(1), 43-47.

O'Donnell, O. (2007). Access to health care in developing countries: breaking down demand side barriers. *Cadernos de Saúde Pública, 23*(12), 2820-2834.

Ross, E. (2007). A tale of two systems: beliefs and practices of South African Muslim and Hindu traditional healers regarding cleft lip and palate. *The Cleft palate-craniofacial journal*W. C. Shaw, Eds., WHO, Geneva, Switzerland, 2002. , *44*(6), 642-648.

WHO. Reports, Human Genetics Programme, Management of non-communicable diseases. International collaborative research on craniofacial anomalies"