

# **Smoking during Pregnancy and Offspring's Smoking Behaviors**

## **Long Term Consequences of Early Exposure to Smoking**

**Beatriz Novak**

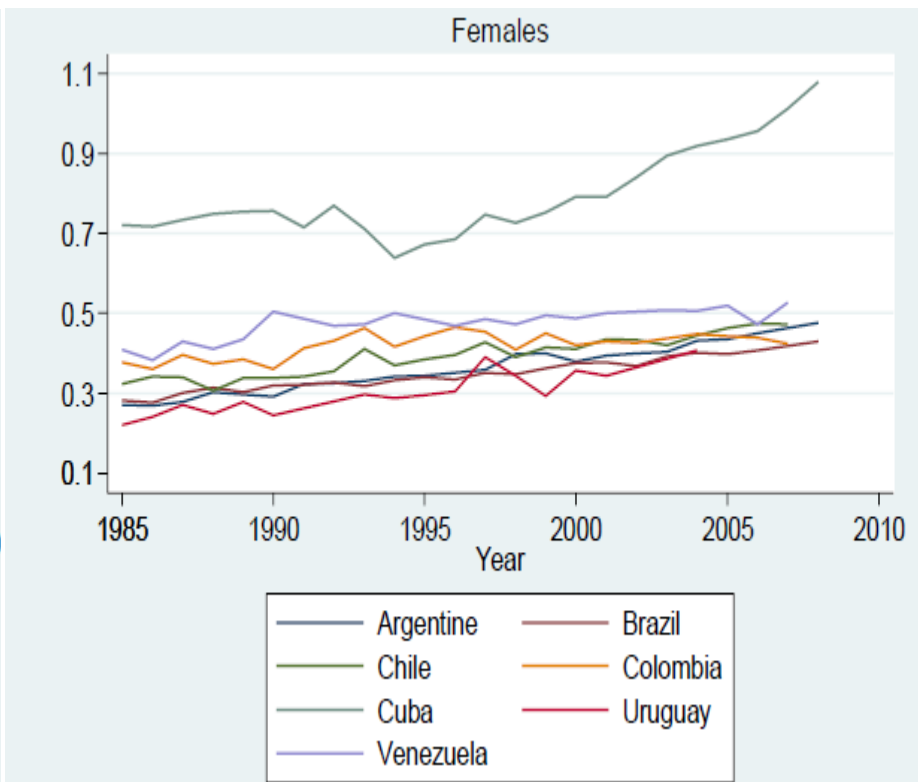
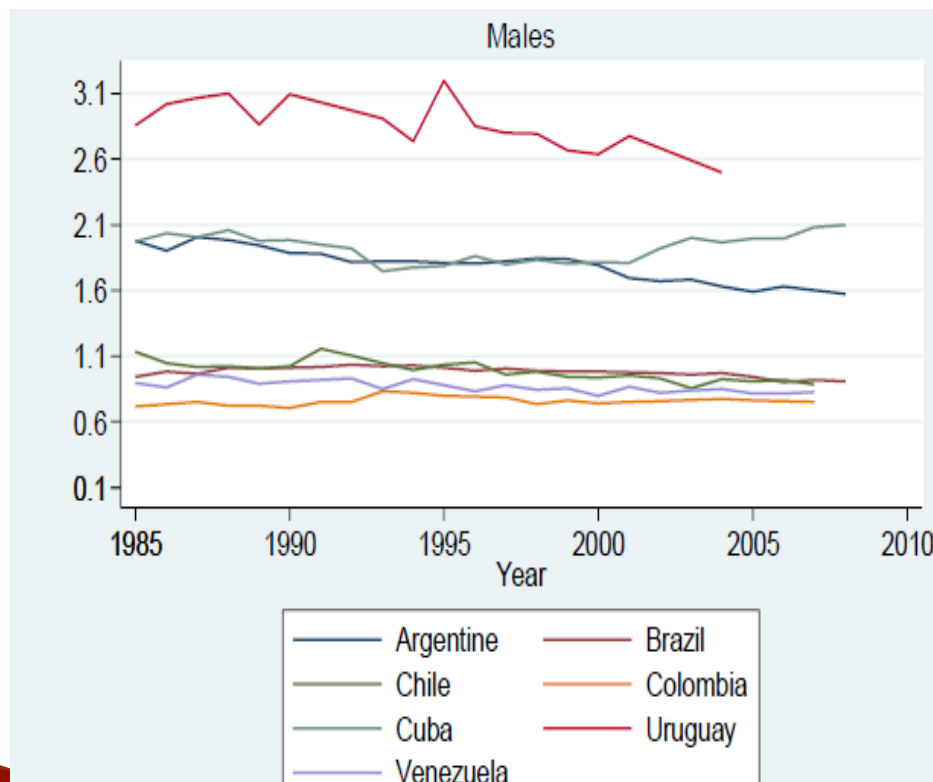
El Colegio de Mexico

**Alberto Palloni**

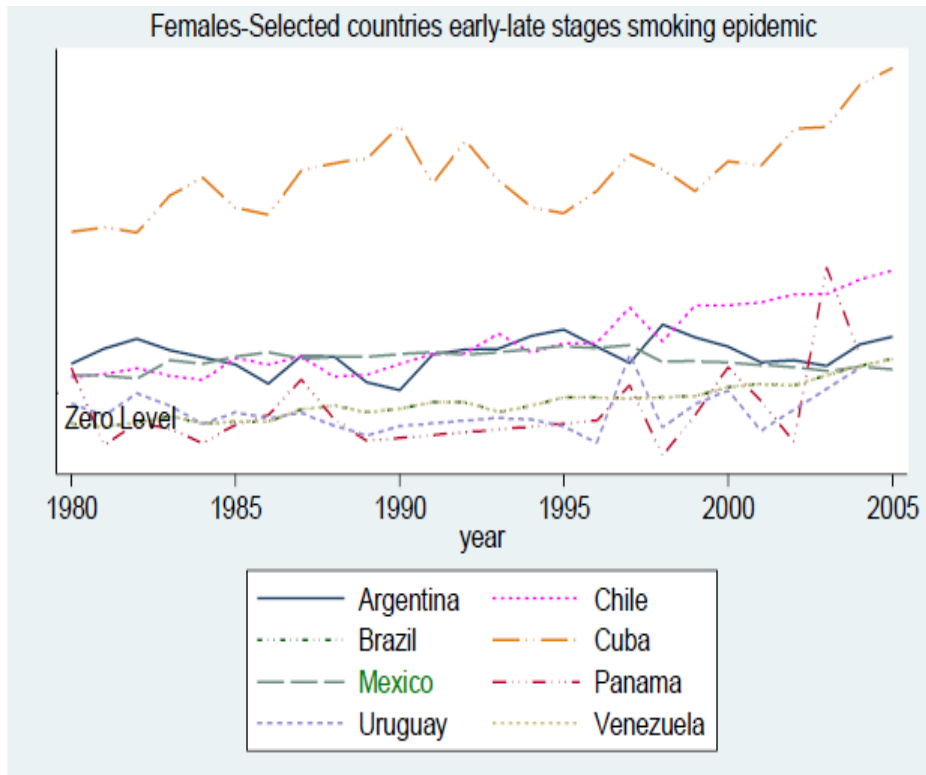
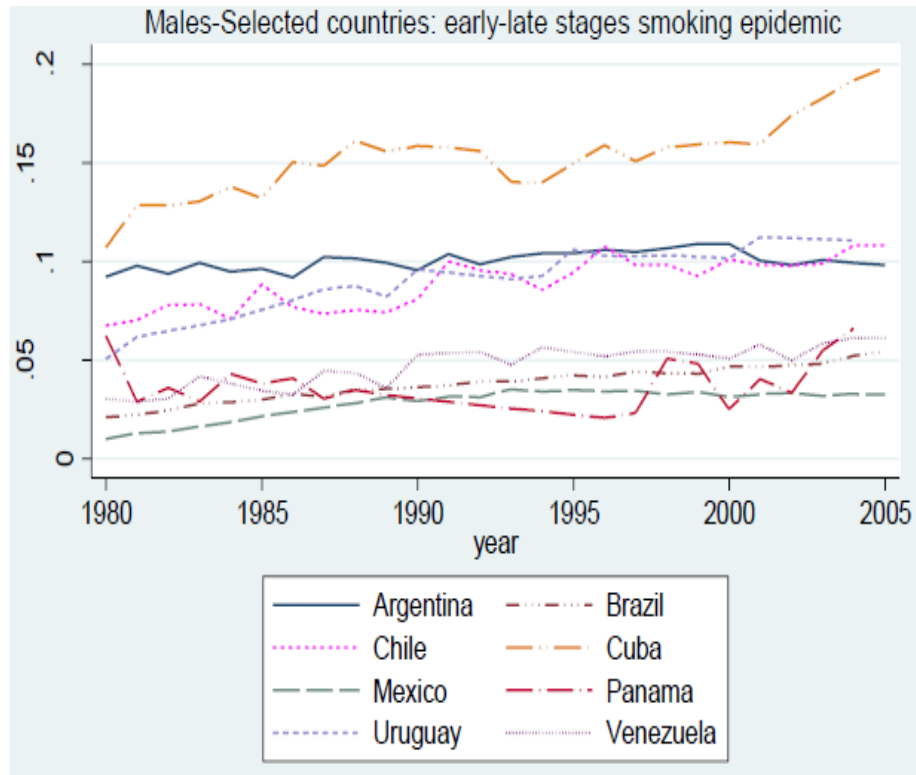
University of Wisconsin – Madison

**REVES 2013 – Austin, TX**

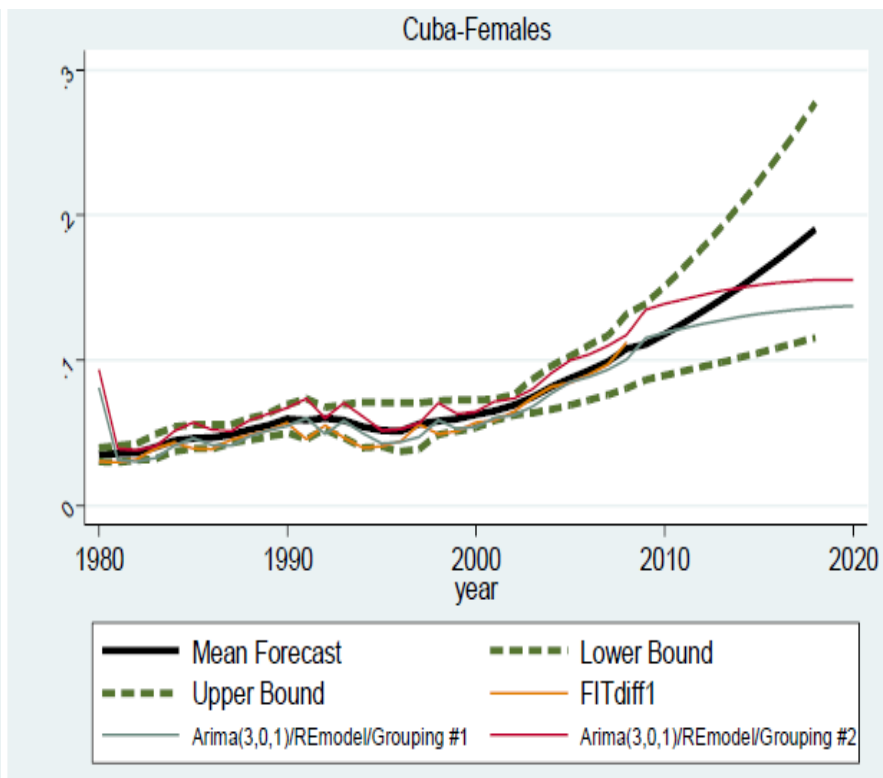
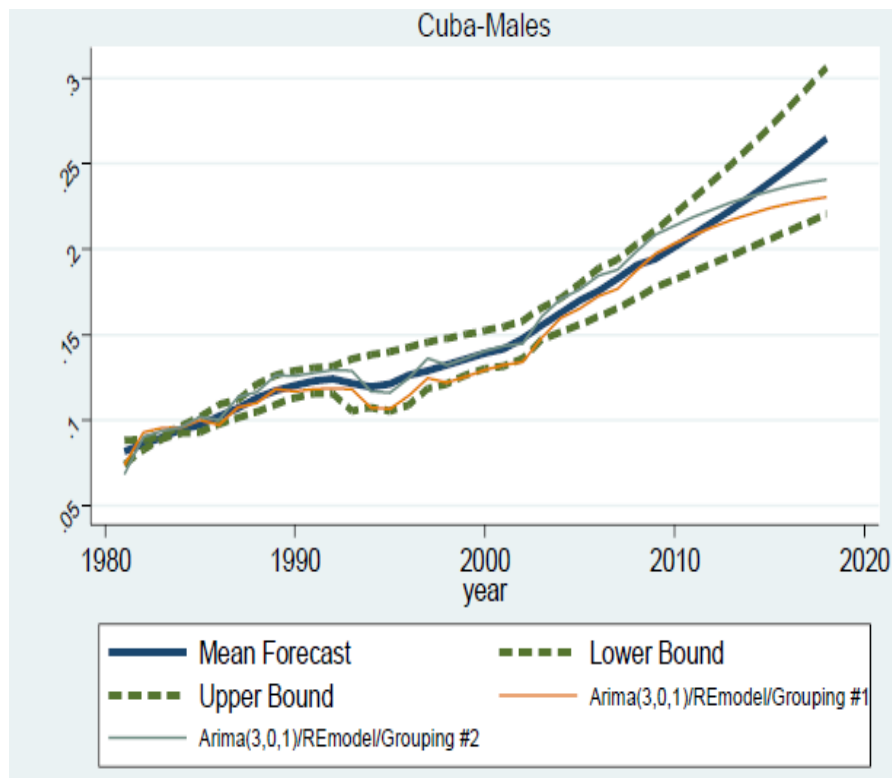
# The Footprint of Smoking in Latin America: Lung Cancer Mortality Rates by Country and Year



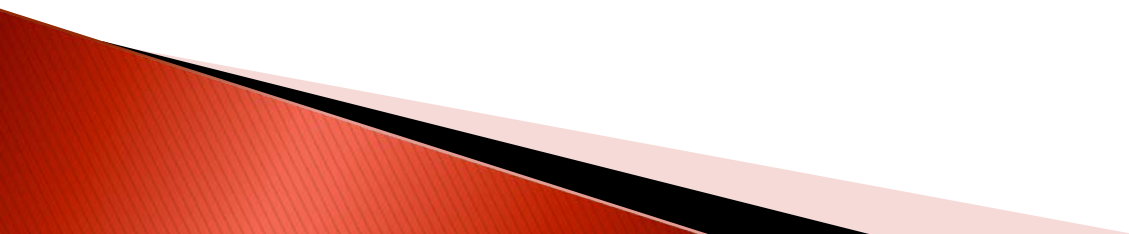
# Relative (Mean) Differences $E(50)$ Counterfactual - Observed



# Alternative Forecasts of Proportionate Years of Life Lost (E50) – The Case of Cuba



# **It is Important to Understand the Dynamics of Smoking Addiction**

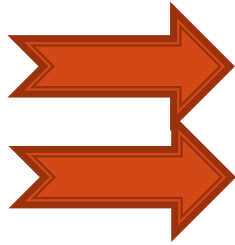


# It is Important to Understand the Dynamics of Smoking Addiction

- **Age of smoking initiation**  
 **Very early in life**

# It is Important to Understand the Dynamics of Smoking Addiction




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**Very early in life**

**Probability of cessation among adults inversely related to age at initiation**

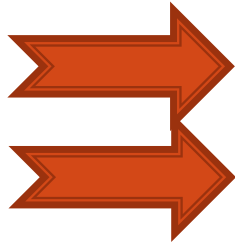
# **It is Important to Understand the Dynamics of Smoking Addiction**

- **Age of smoking initiation**
  -  **Very early in life**
  -  **Probability of cessation among adults inversely related to age at initiation**
- **Smoking level**
  -  **Even infrequent experimental smoking in adolescence increases de risk of adult smoking**



# **It is Important to Understand the Dynamics of Smoking Addiction**

- **Age of smoking initiation**



**Very early in life**

**Probability of cessation among adults inversely related to age at initiation**

- **Smoking level**



**Even infrequent experimental smoking in adolescence increases the risk of adult smoking**

- **Addiction**



**Cessation is difficult and smoking is likely to be a long-term addiction**

# The Onset of Smoking is Influenced by Conditions Experienced Early in Childhood and Adolescence

- **Socioeconomic Status**
- **Household Characteristics**
- **Family Stability**
- **Poverty and Insecurity**
- **Internalizing and Externalizing Behaviors**
- **Social Acceptance**

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- **Parental Smoking**
- **Siblings' Smoking**
- **Parental and Sibling Relations**
- **Peers and School Environments**

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- **In Utero Exposure**

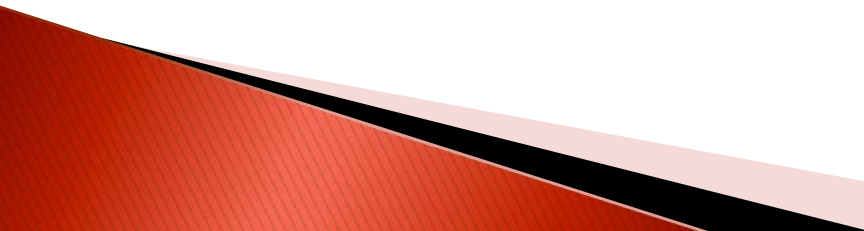
# The Onset of Smoking is Influenced by Conditions Experienced Early in Childhood and Adolescence – The Case of Brazil

- **2008 PNAD**
  - **Parental Influence**
  - **Sibling Influence**
- 

# Main Objective

**Investigate whether maternal smoking during pregnancy is associated with increased risk of offspring's smoking**

# **Data – Cebu Longitudinal Health and Nutrition Survey (CLHNS)**

- **Covers a wide range of health-related topics specific to each stage of the life cycle**
  - **1983-84 Original CLHNS (Pregnancy)**
  - **1984-86 Post-partum/Infancy (bi-monthly surveys)**
  - **1991/1994/1998/2002/2005 Follow-up surveys**
- 

# CLHNS - Sample

- **Interviews: 3327 pregnant women (6<sup>th</sup>-7<sup>th</sup> month)**
- **Live Births (1983-1984): 3080 to 3120 women**
- **In 2002: 2050 children aged 17-19**
- **N=2050**



# CLHNS – Sample Description: Mothers

|                                   |      |  |      |
|-----------------------------------|------|--|------|
| <b>Age at Pregnancy (%)</b>       |      | <b>Smoking Status DP (%)</b>                       |      |
| 14-20                             | 25.4 | Never Smoked                                       | 84.0 |
| 21-24                             | 19.1 | Stopped Smoking                                    | 2.4  |
| 25-29                             | 28.2 | Smoked   | 13.5 |
| 30+                               | 27.3 |  |      |
| <b>Educational Attainment (%)</b> |      | <b>Breastfed Index Child by Smoking Status (%)</b> |      |
| Incomplete Elementary             | 57.2 | Never Smoked                                       | 88.1 |
| Incomplete HS                     | 29.0 | Stopped Smoking                                    | 82.0 |
| HS and more                       | 13.8 | Smoked   | 95.0 |
| <b>HH member's Toilet (%)</b>     | 38.0 |  |      |
| <b>House Materials (%)</b>        |      | <b>Alcohol Drinking DP (%)</b>                     |      |
| Light                             | 43.8 | Never  | 65.4 |
| Mixed                             | 39.0 | Stopped  | 10.3 |
| Strong                            | 17.2 | Drank  | 24.3 |

# CLHNS – Sample Description: Child

|                                   |         |                           |      |
|-----------------------------------|---------|---------------------------|------|
| <b>Females (%)</b>                | 47.1    | <b>Smoking Status (%)</b> |      |
| <b>Age (%)</b>                    |         | Never Smoked              | 48.9 |
|                                   | 17 0.7  | Ever Smoker               | 51.1 |
|                                   | 18 80.5 | Current Smoker            | 26.1 |
|                                   | 19 18.8 |                           |      |
| <b>Educational Attainment (%)</b> |         | <b>Initiation Age (%)</b> |      |
| Incomplete Elementary             | 11.5    | 5-9                       | 2.0  |
| Incomplete HS                     | 59.7    | 10-11                     | 4.4  |
| HS and more                       | 28.8    | 12-13                     | 13.3 |
| <b>Other HH Smokers (%)</b>       | 58.0    | 14-15                     | 29.6 |
| <b>Friends Smokers (%)</b>        | 60.8    | 16-17                     | 32.6 |
|                                   |         | 18-19                     | 17.8 |
|                                   |         |                           |      |
|                                   |         |                           |      |

# Effects Estimates – Logistic Models

## Child Ever/Current Smoker Age 17-19

| Predictor                     | Model for Variable |                   |                   |                   |                   |                   |
|-------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                               | Ever Smoker        | Current Smoker    | Ever Smoker       | Current Smoker    | Ever Smoker       | Current Smoker    |
| <b>Sex of Index Child</b>     | <b>.12 (.01)</b>   | <b>.07 (.01)</b>  | <b>.12 (.01)</b>  | <b>.06 (.01)</b>  | <b>.12 (.01)</b>  | <b>.06 (.01)</b>  |
| <b>Mother Stopped Smoking</b> | .96 (.33)          | 1.35 (.50)        | .97 (.33)         | 1.43 (.54)        | .99 (.34)         | 1.42 (.53)        |
| <b>Mother Smoked DP</b>       | <b>1.80 (.27)</b>  | <b>2.06 (.35)</b> | <b>1.76 (.28)</b> | <b>1.76 (.28)</b> | <b>1.74 (.28)</b> | <b>1.83 (.32)</b> |
| <b>Mother Aged 14-20</b>      |                    |                   | .95 (.15)         | .86 (.15)         | .94 (.15)         | .86 (.15)         |
| <b>Mother Aged 25-29</b>      |                    |                   | 1.07 (.15)        | 1.02 (.16)        | 1.07 (.15)        | 1.01 (.16)        |
| <b>Mother Aged 30+</b>        | -                  |                   | .98 (.14)         | .84 (.14)         | .98 (.14)         | .84 (.14)         |
| <b>Mother Some HS</b>         |                    |                   | 1.04 (.12)        | <b>.78 (.11)</b>  | 1.06 (.13)        | .81 (.11)         |
| <b>Mother HS or More</b>      |                    |                   | .84 (.13)         | <b>.45 (.13)</b>  | .88 (.15)         | <b>.51 (.11)</b>  |
| <b>HH member's Toilet</b>     |                    |                   |                   |                   | .88 (.11)         | .87 (.11)         |
| <b>House Mixed Material</b>   | -                  |                   |                   |                   | 1.00 (.12)        | 1.09 (.15)        |
| <b>House Strong Material</b>  |                    |                   |                   |                   | 1.04 (.17)        | .84 (.16)         |
| Cons                          | 1.91 (4.46)        | .33 (.02)         | 1.73 (4.05)       | .05 (.13)         | 1.72 (4.06)       | .06 (.16)         |
| N                             | 1967               | 1968              | 1967              | 1968              | 1966              | 1967              |
| LL                            | -1127              | -896              | -1126             | -885              | -1125             | -883              |

Note: Estimated effects on odds. All models control for age of index child, SE in parentheses

Red Numbers: p-value<0.001; Orange Numbers: p-value<0.01; Blue Numbers: p-value <0.1

# Effects Estimates – Logistic Models

## Child Ever/Current Smoker Age 17-19

| Predictor                         | Model for Variable           |                              |                              |                              |                              |                              |
|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
|                                   | Ever Smoker                  | Current Smoker               | Ever Smoker                  | Current Smoker               | Ever Smoker                  | Current Smoker               |
| <b>Sex of Index Child</b>         | <b>.12 (.01)</b>             | <b>.07 (.01)</b>             | <b>.12 (.01)</b>             | <b>.06 (.01)</b>             | <b>.12 (.01)</b>             | <b>.06 (.01)</b>             |
| <del>Mother Stopped Smoking</del> | <del>.96 (.33)</del>         | <del>1.35 (.50)</del>        | <del>.97 (.33)</del>         | <del>1.43 (.54)</del>        | <del>.99 (.34)</del>         | <del>1.42 (.53)</del>        |
| <del>Mother Smoked DP</del>       | <del><b>1.80 (.27)</b></del> | <del><b>2.06 (.35)</b></del> | <del><b>1.76 (.28)</b></del> | <del><b>1.76 (.28)</b></del> | <del><b>1.74 (.28)</b></del> | <del><b>1.83 (.32)</b></del> |
| Mother Aged 14-20                 |                              |                              | .95 (.15)                    | .86 (.15)                    | .94 (.15)                    | .86 (.15)                    |
| Mother Aged 25-29                 |                              |                              | 1.07 (.15)                   | 1.02 (.16)                   | 1.07 (.15)                   | 1.01 (.16)                   |
| Mother Aged 30+                   | -                            |                              | .98 (.14)                    | .84 (.14)                    | .98 (.14)                    | .84 (.14)                    |
| Mother Some HS                    |                              |                              | 1.04 (.12)                   | <b>.78 (.11)</b>             | 1.06 (.13)                   | .81 (.11)                    |
| Mother HS or More                 |                              |                              | .84 (.13)                    | <b>.45 (.13)</b>             | .88 (.15)                    | <b>.51 (.11)</b>             |
| HH member's Toilet                |                              |                              |                              |                              | .88 (.11)                    | .87 (.11)                    |
| House Mixed Material              | -                            |                              |                              |                              | 1.00 (.12)                   | 1.09 (.15)                   |
| House Strong Material             |                              |                              |                              |                              | 1.04 (.17)                   | .84 (.16)                    |
| Cons                              | 1.91 (4.46)                  | .33 (.02)                    | 1.73 (4.05)                  | .05 (.13)                    | 1.72 (4.06)                  | .06 (.16)                    |
| N                                 | 1967                         | 1968                         | 1967                         | 1968                         | 1966                         | 1967                         |
| LL                                | -1127                        | -896                         | -1126                        | -885                         | -1125                        | -883                         |

Note: Estimated effects on odds. All models control for age of index child, SE in parentheses

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| Predictor                          | Model for Variable |                   |                   |                   |                   |                   |
|------------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                    | Ever Smoker        | Current Smoker    | Ever Smoker       | Current Smoker    | Ever Smoker       | Current Smoker    |
| <b>Sex of Index Child</b>          | <b>.12 (.01)</b>   | <b>.06 (.01)</b>  | <b>.15 (.02)</b>  | <b>.08 (.01)</b>  | <b>.16 (.02)</b>  | <b>.08 (.01)</b>  |
| <b>Mother Stopped Smoking</b>      | 1.02 (.35)         | 1.48 (.56)        | .91 (.33)         | 1.31 (.50)        | .88 (.32)         | 1.24 (.50)        |
| <b>Mother Smoked DP</b>            | <b>1.71 (.27)</b>  | <b>1.81 (.31)</b> | <b>1.52 (.25)</b> | <b>1.63 (.30)</b> | <b>1.39 (.24)</b> | <b>1.45 (.28)</b> |
| <b>Mother Some HS</b>              | 1.10 (.14)         | .88 (.12)         | 1.09 (.14)        | .87 (.15)         | 1.21 (.16)        | .98 (.15)         |
| <b>Mother HS or More</b>           | .94 (.17)          | <b>.59 (.13)</b>  | .95 (.18)         | <b>.57 (.13)</b>  | 1.20 (.23)        | .70 (.16)         |
| <b>IQ at 7 years<sup>(a)</sup></b> | <b>.78 (.08)</b>   | <b>.65 (.08)</b>  | <b>.83 (.09)</b>  | <b>.68 (.09)</b>  | 1.00 (.12)        | .86 (.12)         |
| <b>Smokers in HH</b>               |                    |                   | <b>1.12 (.06)</b> | <b>1.11 (.06)</b> | <b>1.10 (.06)</b> | <b>1.10 (.06)</b> |
| <b>Friends Non-Smokers</b>         |                    |                   | <b>.36 (.04)</b>  | <b>.18 (.03)</b>  | <b>.37 (.04)</b>  | <b>.20 (.03)</b>  |
| <b>Index Child less than HS</b>    |                    |                   |                   |                   | <b>1.78 (.34)</b> | <b>2.10 (.39)</b> |
| <b>Index Child HS+</b>             |                    |                   |                   |                   | <b>.56 (.08)</b>  | <b>.62 (.11)</b>  |
| Cons                               | 1.76 (4.14)        | .33 (.02)         | 3.13 (7.68)       | .09 (.26)         | 1.73 (4.05)       | .05 (.13)         |
| N                                  | 1966               | 1967              | 1935              | 1935              | 1933              | 1933              |
| LL                                 | -1122              | -896              | -1052             | -797              | -1037             | -784              |

*Note:* Estimated effects on odds. All models control for an indicator of poverty (housing material quality), and indicator of hygiene (availability of potable water) age of index child, and age of the mother at pregnancy ; SE in parentheses

(a) Dummy for IQ equal to above median of the sample standardized distribution.

**Red Numbers: p-value<0.001; Orange Numbers: p-value<0.01; Green Numbers: p-value<.05; Blue Numbers: p-value <0.1**

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| Predictor                    | Model for Variable |                |             |                |             |                |
|------------------------------|--------------------|----------------|-------------|----------------|-------------|----------------|
|                              | Ever Smoker        | Current Smoker | Ever Smoker | Current Smoker | Ever Smoker | Current Smoker |
| Sex of Index Child           | .12 (.01)          | .06 (.01)      | .15 (.02)   | .08 (.01)      | .16 (.02)   | .08 (.01)      |
| Mother Stopped Smoking       | 1.02 (.35)         | 1.48 (.56)     | .91 (.33)   | 1.31 (.50)     | .88 (.32)   | 1.24 (.50)     |
| Mother Smoked DP             | 1.71 (.27)         | 1.81 (.31)     | 1.52 (.25)  | 1.63 (.30)     | 1.39 (.24)  | 1.45 (.28)     |
| Mother Some HS               | 1.10 (.14)         | .88 (.12)      | 1.09 (.14)  | .87 (.15)      | 1.21 (.16)  | .98 (.15)      |
| Mother HS or More            | .94 (.17)          | .59 (.13)      | .95 (.18)   | .57 (.13)      | 1.20 (.23)  | .70 (.16)      |
| IQ at 7 years <sup>(a)</sup> | .78 (.08)          | .65 (.08)      | .83 (.09)   | .68 (.09)      | 1.00 (.12)  | .86 (.12)      |
| Smokers in HH                |                    |                | 1.12 (.06)  | 1.11 (.06)     | 1.10 (.06)  | 1.10 (.06)     |
| Friends Non-Smokers          |                    |                | .36 (.04)   | .18 (.03)      | .37 (.04)   | .20 (.03)      |
| Index Child less than HS     |                    |                |             |                | 1.78 (.34)  | 2.10 (.39)     |
| Index Child HS+              |                    |                |             |                | .56 (.08)   | .62 (.11)      |
| Cons                         | 1.76 (4.14)        | .33 (.02)      | 3.13 (7.68) | .09 (.26)      | 1.73 (4.05) | .05 (.13)      |
| N                            | 1966               | 1967           | 1935        | 1935           | 1933        | 1933           |
| LL                           | -1122              | -896           | -1052       | -797           | -1037       | -784           |

Note: Estimated effects on odds. All models control for an indicator of poverty (housing material quality), and indicator of hygiene (availability of potable water) age of index child, and age of the mother at pregnancy ; SE in parentheses

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# Effects Estimates – Multinomial Logistic Models: Smoking Status during Pregnancy

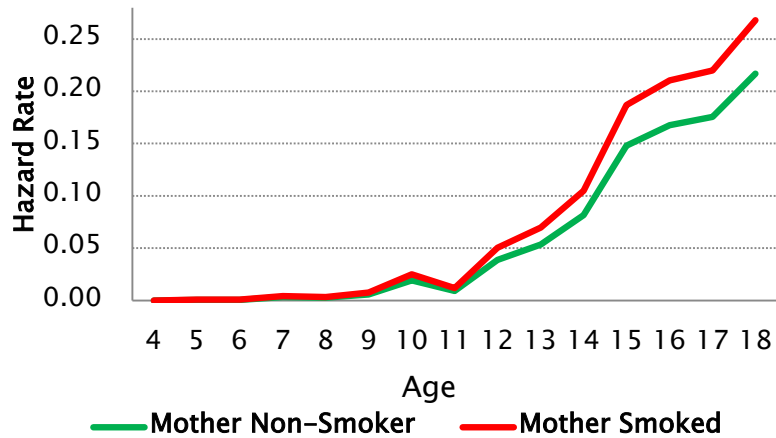
| Predictor                    | Model for Variable     |                   |
|------------------------------|------------------------|-------------------|
|                              | Mother Stopped Smoking | Mother Smoked DP  |
| <b>Mother Aged 14-20</b>     | .60 (.33)              | <b>0.47 (.12)</b> |
| <b>Mother Aged 25-29</b>     | 1.30 (.52)             | <b>1.45 (.27)</b> |
| <b>Mother Aged 30+</b>       | 1.48 (.59)             | <b>1.86 (.34)</b> |
| <b>Mother Some HS</b>        | .53 (.21)              | <b>.51 (.09)</b>  |
| <b>Mother HS or More</b>     | 1.22 (.50)             | <b>.23 (.08)</b>  |
| <b>HH member's Toilet</b>    | 1.32 (.43)             | <b>.54 (.09)</b>  |
| <b>House Mixed Material</b>  | 1.54 (.53)             | <b>0.73 (.11)</b> |
| <b>House Strong Material</b> | .87 (.42)              | .69 (.16)         |
| Cons                         | <b>.02 (.01)</b>       | <b>.25 (.04)</b>  |
| N                            | 2041                   |                   |
| LL                           | -956                   |                   |

Note: Estimated effects on relative risks.

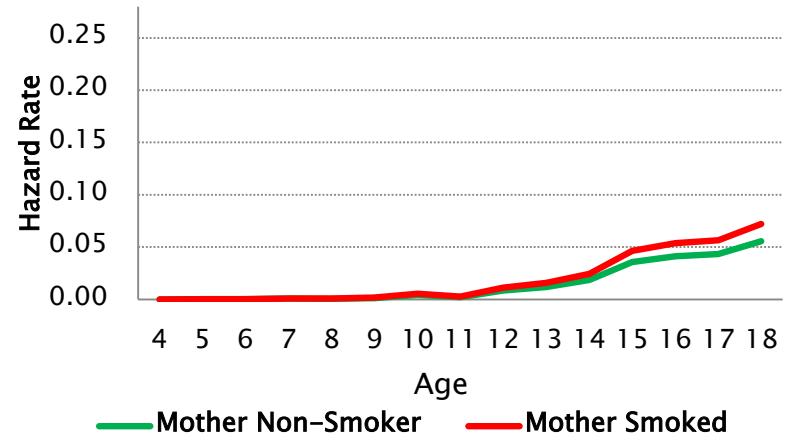
Red Numbers: p-value<0.001; Orange Numbers: p-value<0.01; Green Numbers: p-value<.05; Blue Numbers: p-value <0.1

# Survival Models: Children's Age at Initiation

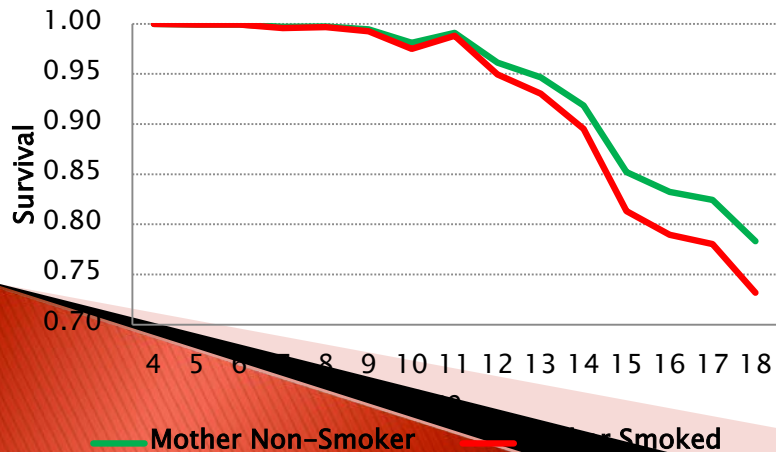
## Males



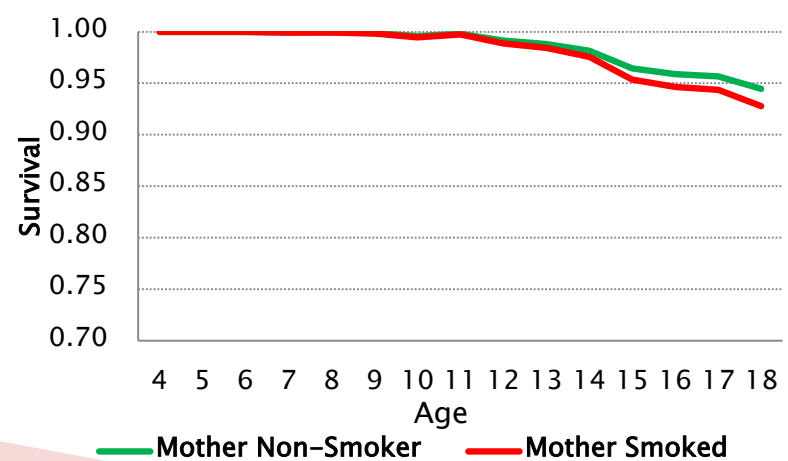
## Females



## Males



## Females





# Main Results

- **Among those mothers who smoked during pregnancy, compared with those who never smoked, the odds that the offspring were ever or current smoker were around 50% higher**
- **The hazard of smoking initiation at early ages is higher among those whose mothers smoked during pregnancy**

# Conclusions

- **Regardless of the possible explanation for the results, the behavioral or the non-behavioral one, the conclusion is the same:**
  - **Reducing the levels of smoking in one generation impacts the prevalence of smoking in the next one directly**
- **More research is needed**

**THANKS**

