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To Light Up or Snuff Out?: Estimating Adolescent Smoking Behavior in Nepal

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UNM

Robert Wood Johnson Foundation **Center for Health Policy**
at the University of New Mexico

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Smoking Prevalence In Nepal
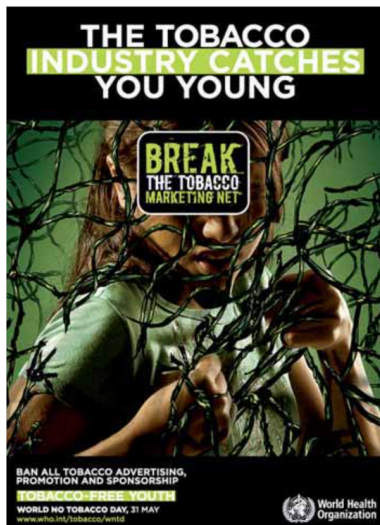
Smoking Prevalence In Nepal

Table: Prevalence of tobacco use: current cigarette smoking

	2012	2017
Adolescents 13-15 yo		

Smoking Prevalence In Nepal

Table: Prevalence of tobacco use: current cigarette smoking

	2012	2017
Adolescents 13-15 yo		
Boys	5.5%	6.8%

Smoking Prevalence In Nepal

Table: Prevalence of tobacco use: current cigarette smoking

	2012	2017
Adolescents 13-15 yo		
Boys	5.5%	6.8%
Girls	0.8%	3.0%

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Motivation

Smoking Prevalence In Nepal

Table: Prevalence of tobacco use: current cigarette smoking

	2012	2017
Adolescents 13-15 yo		
Boys	5.5%	6.8%
Girls	0.8%	3.0%
Adults 15+ yo		

Smoking Prevalence In Nepal

Table: Prevalence of tobacco use: current cigarette smoking

	2012	2017
Adolescents 13-15 yo		
Boys	5.5%	6.8%
Girls	0.8%	3.0%
Adults 15+ yo		
Men	29.8%	26.9%
Women	8.7%	10.1%

Source: WHO MPOWER reports 2013 & 2017

Existing Literature

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Motivation

Existing Literature

■ Piorkowski & Bohara *forthcoming*: Formal education greatly reduced women's smoking behaviors in Nepal.

Existing Literature

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- Jensen & Llera-Muney, 2012: Eight grade students in the Dominican Republic, peer effects and disposable income influence smoking rates.

Existing Literature

■ Piorkowski & Bohara *forthcoming*: Formal education greatly reduced women's smoking behaviors in Nepal.

■ Jensen & Llera-Muney, 2012: Eight grade students in the Dominican Republic, peer effects and disposable income influence smoking rates.

■ Aryal et al., 2013: Amongst teenagers in Nepal, boys are more at risk to start smoking. Short terms smoking related risks and smoking related social risk were less susceptible to start smoking.

Research Questions

■ What factors promote and mitigate smoking behaviors among
adolescents in Nepal?

Research Questions

- What factors promote and mitigate smoking behaviors among adolescents in Nepal?
- Do these factors impact boys and girls differently?

Research Questions

- What factors promote and mitigate smoking behaviors among adolescents in Nepal?
- Do these factors impact boys and girls differently?
- How can these findings be used to create policy to reduce rates current smoking and increase the number of former smokers?

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About This Study

Contribution

- Use two waves of nationally representative data
- Examine boys and girls smoking separately
- Model three smoking status

Overview of Findings

- Having a peer who smokes greatly increases the odds of being a current smoker.
- Many factors influenced boys to start smoking, but only a few influenced girls.
- Girls who know that smoking is harmful decreases the odds of being a former smoker, hence more likely to be a never smoker.
- Exposure to anti-smoking media increased the odds of being a current smoker.

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Conceptual Model

Random Utility Framework

Let the indirect utility for individual i be written as

$$U_{ij} = \mathbf{V}_{ij} + \varepsilon_{ij}$$

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Conceptual Model

Random Utility Framework

Let the indirect utility for individual i be written as

$$U_{ij} = \mathbf{V}_{ij} + \varepsilon_{ij}$$

Where j is a mutually exclusive smoking status: never smoker, current smoker, and former smoker.

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Conceptual Model

Random Utility Framework

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Where j is a mutually exclusive smoking status: never smoker, current smoker, and former smoker.

$$Pr(y_i = j) = Pr(U_{ij} \geq U_{ik}) \forall k$$

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Empirical Model

Empirical Model

■ Smoking Status

$$S_i = f(PE_i, TP_i, HE_i)$$

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Empirical Model

Empirical Model

■ Smoking Status

$$S_i = f(PE_i, TP_i, HE_i)$$

■ Smoking Status: Multinomial Logit

$$p_{ij} = \frac{exp(\mathbf{x}_i'\beta_j)}{\sum\limits_{i=1}^{m} exp(\mathbf{x}_i'\beta_j)} j = 1, ..., m$$

Hypotheses

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Hypotheses

Hypotheses

1. Having a parent or close friend who smokes will increase the likelihood of being a current smoker.

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Hypotheses

Hypotheses

1. Having a parent or close friend who smokes will increase the likelihood of being a current smoker.
2. Those who perceive that smoking has positive social implications will be more likely to be a current smoker.

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Hypotheses

Hypotheses

1. Having a parent or close friend who smokes will increase the likelihood of being a current smoker.
2. Those who perceive that smoking has positive social implications will be more likely to be a current smoker.
3. Girls who know that smoking can lead to weight loss will be more likely to be a current smoker.

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Hypotheses

Hypotheses

1. Having a parent or close friend who smokes will increase the likelihood of being a current smoker.
2. Those who perceive that smoking has positive social implications will be more likely to be a current smoker.
3. Girls who know that smoking can lead to weight loss will be more likely to be a current smoker.
4. Better health education on smoking (formal or informal) increase the odds of being a never smoker or former smoker.

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NLMMS Survey

Global Youth and Tobacco Survey (GYTS)

- GYTS has been administered in over 131 nations
- Two-stage cluster sample → nationally representative of 13-15 year olds
- Two waves of data 2007 and 2011
- 5,090 respondents (2,566 boys and 2,524 girls)

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Summary Stats

	Together Mean(SD)	Boys Mean(SD)	Girls Mean(SD)
Smoking Status (%)			
Never Smoker	87.92	82.13	93.83
Current Smoker	5.31	8.56	1.99
Former Smoker	6.77	9.32	4.18
Peer Influence *(1=yes)*			
Friends Smoke	0.413	0.538	0.285
Parents Smoke	0.489	0.508	0.47

	Together	Boys	Girls
	Mean(SD)	Mean(SD)	Mean(SD)
Perception and Marketing			
Social Perception			
Level of Attraction/ Ease at Parties	-0.00000002	-0.02	0.002
	(1.260)	(1.254)	(1.263)
Popularity	0.000000005	0.006	-0.013
	(1.208)	(1.246)	(1.172)
Perception of Adult Smokers	0.0000000003	0.073	-0.076
	(1.121)	(1.223)	(0.999)
Health Perception			
Cigarettes and Weight (%)			
Gain Weight	6.83	6.95	6.70
Lose Weight	87.62	86.10	89.17
No Differnce[b]	5.50	6.95	4.13
Smoking Cigarettes is Harmful *(1=yes)*	0.880	0.873	0.886
Others Cigarette Smoking Is Harmful to You *(1=yes)*	0.862	0.861	0.863
Media Exposure			
Pro-tobacco Exposure	0.0000000003	0.038	-0.034
	(1.434)	(1.443)	(1.422)

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Summary Stats

	Together Mean(SD)	Boys Mean(SD)	Girls Mean(SD)
Health Education and Anti-Tobacco Awareness			
Quality of Smoking Education *(%)*			
None[b]	16.80	17.42	16.16
Low	16.48	17.77	15.17
Medium	25.60	26.77	24.41
High	41.12	38.04	44.26
Anti-Tobacco Media Exposure *(1=yes)*	0.245	0.242	0.247
Family discussed smoking	0.664	0.653	0.675

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Summary Stats

Empirical Methods

$$y_{ij} = \alpha + \delta \, PeerEffects_i + \beta \, TobaccoPerception_i + \omega \, Education_i + \xi \, Controls_i + \varepsilon_{ij}$$

■ Multinomial logit
  ▶ Test IIA Assumption ▸ IIA
  ▶ Sensitivity analysis: multinomial probit

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Summary Stats

Empirical Methods

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■ Multinomial logit
  ▶ Test IIA Assumption (▸ IIA)
  ▶ Sensitivity analysis: multinomial probit

■ Data for 2007 and 2011 was pooled together

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Summary Stats

Empirical Methods

$$y_{ij} = \alpha + \delta PeerEffects_i + \beta TobaccoPerception_i + \omega Education_i + \xi Controls_i + \varepsilon_{ij}$$

■ Multinomial logit
  ▶ Test IIA Assumption ▸ IIA
  ▶ Sensitivity analysis: multinomial probit
■ Data for 2007 and 2011 was pooled together
■ 5 model specifications

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Summary Stats

Empirical Methods

$$y_{ij} = \alpha + \delta PeerEffects_i + \beta TobaccoPerception_i + \omega Education_i + \xi Controls_i + \varepsilon_{ij}$$

- ■ Multinomial logit
  - ▶ Test IIA Assumption ▸ IIA
  - ▶ Sensitivity analysis: multinomial probit
- ■ Data for 2007 and 2011 was pooled together
- ■ 5 model specifications
- ■ All regressions were run seperately for boys and girls, and all together

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Summary Stats

Empirical Methods

$$y_{ij} = \alpha + \boldsymbol{\delta} PeerEffects_i + \boldsymbol{\beta} TobaccoPerception_i + \boldsymbol{\omega} Education_i + \boldsymbol{\xi} Controls_i + \varepsilon_{ij}$$

- ■ Multinomial logit
  - ▶ Test IIA Assumption ⟨ IIA ⟩
  - ▶ Sensitivity analysis: multinomial probit
- ■ Data for 2007 and 2011 was pooled together
- ■ 5 model specifications
- ■ All regressions were run seperately for boys and girls, and all together
- ■ All results use robust standard errors, weights, and are clustered at the school-class level

Table 2: Multinomial Logit Results of Both Sexes Combined and Separately

	Current Smoker			Former Smoker		
	Together	Boys	Girls	Together	Boys	Girls
Peer Influence						
Friends Smoke						
Parents Smoke						
Perception and Marketing						
Social Perception						
Level of Attraction/ Ease at Parties						
Popularity						
Perception of Adult Smokers						
Health Perception						
Cigarettes and Weight						
Gain Weight						
Lose Weight						
Smoking Cigarettes is Harmful						
Health Education and Anti Tobacco Awareness						
Health Education						
Quality of Smoking Education						
Low						
Medium						
High						
Informal Education						
Anti Tobacco Media Exposure						

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Friends Smoke	***	***	***			
Parents Smoke	*	*				
Perception and Marketing						
Social Perception						
Level of Attraction/ Ease at Parties						
Popularity	***	***				
Perception of Adult Smokers			**			
Health Perceptption						
Cigarettes and Weight						
Gain Weight	**	**				
Lose Weight	***	***				
Smoking Cigarettes is Harmful						
Health Education and Anti Tobacco Awareness						
Health Education						
Quality of Smoking Education						
Low						
Medium			*			
High	**	*	*			
Informal Education						
Anti Tobacco Media Exposure	***	**	**			

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Perception and Marketing						
Social Perception						
Level of Attraction/ Ease at Parties						
Popularity	***	***			*	
Perception of Adult Smokers			**	***	**	
Health Perceptiion						
Cigarettes and Weight						
Gain Weight	**	**				
Lose Weight	***	***				
Smoking Cigarettes is Harmful				***	*	***
Health Education and Anti Tobacco Awareness						
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Friends Smoke	***	***	***	***	***	***
Parents Smoke	*	*				
Perception and Marketing						
Social Perception						
Level of Attraction/ Ease at Parties						
Popularity	***	***			*	
Perception of Adult Smokers			**	***	**	
Health Percetption						
Cigarettes and Weight						
Gain Weight	**	**				
Lose Weight	***	***				
Smoking Cigarettes is Harmful				***	*	***
Health Education and Anti Tobacco Awareness						
Health Education						
Quality of Smoking Education						
Low						
Medium			*			
High	**	*	*			
Informal Education						
Anti Tobacco Media Exposure	***	**	**	*		

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How to reduce adolescent smoking in Nepal

■ The Tobacco Control and Regulatory Bill - 2011

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes

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Policy Implications

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
- Friends Smoke ⇑ Adolescent Smokes

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Policy Implications

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
- Friends Smoke ⇑ Adolescent Smokes: Don't sell to people under 18 years old

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
- Friends Smoke ⇑ Adolescent Smokes: Don't sell to people under 18 years old
- Increase anti-smoking education quality

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke $\uparrow$ Adolescent Smokes: Enforce ban on smoking in private homes
- Friends Smoke $\Uparrow$ Adolescent Smokes: Don't sell to people under 18 years old
- Increase anti-smoking education quality
- Rethink anti-tobacco advertisements

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
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- Increase anti-smoking education quality
- Rethink anti-tobacco advertisements
- Increase tobacco tax: WHO best practice > 75% of the retail price should come from taxes

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Policy Implications

How to reduce adolescent smoking in Nepal

- The Tobacco Control and Regulatory Bill - 2011
- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
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  - ▶ In 2016 Nepal is at 26%

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Policy Implications

How to reduce adolescent smoking in Nepal

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- Parents Smoke ↑ Adolescent Smokes: Enforce ban on smoking in private homes
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- Increase anti-smoking education quality
- Rethink anti-tobacco advertisements
- Increase tobacco tax: WHO best practice > 75% of the retail price should come from taxes
  - ▶ In 2016 Nepal is at 26% the lowest reported in South East Asia

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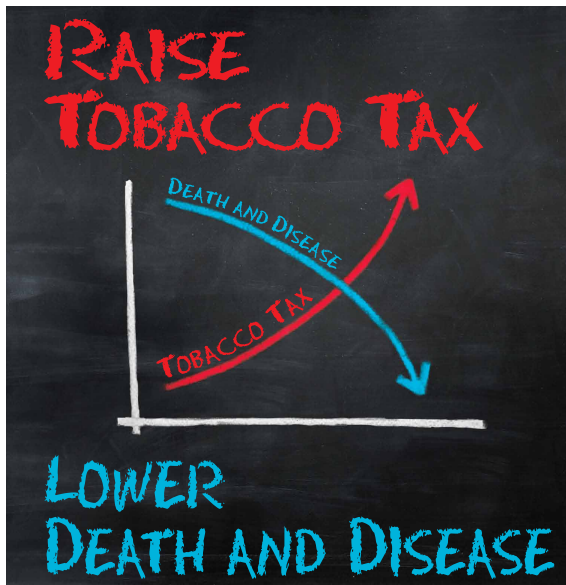
Limitations

Limitations

- GYTS and demographic information
- Cross-sectional data
- Preliminary analysis

Extending this project

■ Update modeling

Extending this project

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  ▶ Excess zeros: multinomial probit with excess zeros, rare events multinomial logit, or random sampling of non-smokers
  ▶ Count of cigarettes smoked: interval estimation or hurdle model

Extending this project

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  ▶ Excess zeros: multinomial probit with excess zeros, rare events multinomial logit, or random sampling of non-smokers
  ▶ Count of cigarettes smoked: interval estimation or hurdle model
  ▶ Split up former smokers

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Future Work

Extending this project

■ Update modeling
  ▶ Excess zeros: multinomial probit with excess zeros, rare events multinomial logit, or random sampling of non-smokers
  ▶ Count of cigarettes smoked: interval estimation or hurdle model
  ▶ Split up former smokers

■ Smokeless tobacco - Nepal 12.9% of girls and 4.8% of women

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Conclusion

Final Remarks

■ This is one of the first studies use nationally representative
  data to analyze adolescent smoking in Nepal.

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- ■ This is one of the first studies use nationally representative data to analyze adolescent smoking in Nepal.
- ■ Friends who smoke greatly ↑ the odds of smoking. High quality education ↑ odds of being a never smoker.

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- This is one of the first studies use nationally representative data to analyze adolescent smoking in Nepal.
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- Boys: having parents who smoke or think smoking makes people popular ↑ current smoker.

Final Remarks

- This is one of the first studies use nationally representative data to analyze adolescent smoking in Nepal.
- Friends who smoke greatly ↑ the odds of smoking. High quality education ↑ odds of being a never smoker.
- Boys: having parents who smoke or think smoking makes people popular ↑ current smoker.
- Girls: think that adult smokers are cool ↑. But knowing that smoking is harmful ↑ odds of being a never smoker.

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Future Research

Future Research and Research Interests

■ I am an applied microeconomist that concentrates on health
and gender.

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■ Dissertation Related Research: Influencing Health Behaviors
  ▶ WTP for a SSB Tax in New Mexico
  ▶ Support for Expanding Navajo Nation SSB Tax
  ▶ Adolescent smoking behaviors in Nepal

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  - Adolescent smoking behaviors in Nepal
- Future Research
  - Gender disparities in health outcomes
  - Structural constraints on health decisions

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  - ▶ Adolescent smoking behaviors in Nepal
- ■ Future Research
  - ▶ Gender disparities in health outcomes
  - ▶ Structural constraints on health decisions
  - ▶ Domestic Research: Racial/ethnic disparity in folic acid intake
  - ▶ International Research: Non-cigarette usage by women

Contact Information

Please feel free to contact me about this or other projects!
Thank you for your time.
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Table 2: Multinomial Logit Results of Both Sex Combined and Boys and Girls Separately

	Current Smoker			Former Smoker		
	Together	Boys	Girls	Together	Boys	Girls
Peer Influence						
Friends Smoke	2.102***	1.949***	2.618***	0.781***	0.645***	0.849***
	(0.248)	(0.298)	(0.465)	(0.190)	(0.203)	(0.281)
Parents Smoke	0.341*	0.424*	0.0230	0.127	0.0973	0.186
	(0.177)	(0.238)	(0.470)	(0.131)	(0.179)	(0.266)
Perception and Marketing						
Social Perception						
Level of Attraction/ Ease at Parties	-0.0342	-0.0526	0.0804	0.0448	0.0203	0.0764
	(0.0755)	(0.0907)	(0.154)	(0.0691)	(0.0804)	(0.117)
Popularity	0.190***	0.295***	-0.239	0.0449	0.127*	-0.120
	(0.0645)	(0.0806)	(0.172)	(0.0680)	(0.0742)	(0.134)
Perception of Adult Smokers	0.0718	0.0352	0.237**	0.140***	0.137**	0.0925
	(0.0690)	(0.0784)	(0.113)	(0.0543)	(0.0686)	(0.0942)
Health Perception						
Cigarettes and Weight						
Gain Weight	-1.081**	-1.284**	-0.377	0.118	-0.313	1.549
	(0.494)	(0.585)	(0.898)	(0.356)	(0.400)	(0.972)
Lose Weight	-1.012***	-1.148***	-0.303	-0.199	-0.410	0.811
	(0.326)	(0.394)	(0.695)	(0.253)	(0.294)	(0.784)
Smoking Cigarettes is Harmful	0.320	0.303	0.179	-0.671***	-0.432*	-1.169***
	(0.349)	(0.372)	(0.610)	(0.229)	(0.261)	(0.391)
Other's Smoking Harmful	-0.286	-0.152	-0.730	0.206	0.180	0.381
	(0.258)	(0.309)	(0.534)	(0.240)	(0.331)	(0.405)
Media Exposure						
Pro-tobacco Exposure	0.0822	0.0707	0.198	-0.00837	0.0223	-0.0569
	(0.0764)	(0.0831)	(0.137)	(0.0680)	(0.0815)	(0.107)

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	Current Smoker			Former Smoker		
	Together	Boys	Girls	Together	Boys	Girls
Health Education and Anti Tobacco Awareness						
Health Education						
Quality of Smoking Education						
Low	-0.0106	-0.0114	-0.131	0.0767	-0.233	0.675
	(0.226)	(0.275)	(0.544)	(0.274)	(0.310)	(0.551)
Medium	-0.465	-0.299	-1.298*	-0.0281	0.0341	-0.156
	(0.299)	(0.349)	(0.699)	(0.230)	(0.271)	(0.516)
High	-0.559**	-0.474*	-0.933*	-0.136	-0.236	0.153
	(0.224)	(0.251)	(0.481)	(0.246)	(0.257)	(0.537)
Informal Education						
Anti Tobacco Media Exposure	0.677***	0.548**	1.084**	0.316*	0.388	0.335
	(0.206)	(0.235)	(0.475)	(0.190)	(0.258)	(0.422)
Parents Discuss Smoking Dangers	0.170	0.193	0.203	0.104	0.209	-0.0875
	(0.168)	(0.205)	(0.377)	(0.168)	(0.182)	(0.319)

Table 2: Multinomial Logit Results of Both Sex Combined and Boys and Girls Separately

	Current Smoker			Former Smoker		
	Together	Boys	Girls	Together	Boys	Girls
Controls						
Age						
14-15 yo	0.504	0.772	-0.409	0.355	0.310	0.492
	(0.379)	(0.498)	(0.524)	(0.269)	(0.339)	(0.383)
16 + yo	1.237***	1.458***	0.542	0.533*	0.571*	0.374
	(0.391)	(0.534)	(0.592)	(0.288)	(0.346)	(0.411)
Grade						
Eighth	1.115***	0.815*	3.133***	0.119	0.256	-0.00320
	(0.426)	(0.484)	(0.886)	(0.308)	(0.389)	(0.390)
Ninth	0.842*	0.602	2.736***	0.164	0.499	-0.435
	(0.440)	(0.463)	(0.924)	(0.329)	(0.422)	(0.411)
Tenth	0.907**	0.775	2.296**	0.366	0.700	-0.132
	(0.454)	(0.492)	(1.089)	(0.344)	(0.439)	(0.517)
Year 2011	-0.669***	-0.729**	-0.578	0.125	-0.00596	0.530
	(0.245)	(0.285)	(0.475)	(0.222)	(0.254)	(0.400)
Female	-1.029***			-0.662***		
	(0.272)			(0.206)		
Constant	-4.409***	-4.344***	-6.760***	-2.944***	-2.955***	-4.586***
	(0.796)	(0.886)	(1.571)	(0.454)	(0.516)	(1.075)
Observations	4,447	2,234	2,213	4,447	2,234	2,213
AIC	3101716	2128226	906935.8	3101716	2128226	906935.8
BIC	3102011	2128477	907186.7	3102011	2128477	907186.7

Notes: The base category for smoking status is never smoker. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the school-classroom level. *Source:* GYTS Nepal 2007 and 2011.

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Principal Component Analysis

- A data reduction method
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- Takes many similar measures and reduces these measures into the minimum number of components with the maximum amount of variation
- Used for social perception (7 variables) and pro-tobacco exposure (5 variables)
- Kept components whose eigenvalues exceeded one (Kaiser's Rule)
- Used varimax rotation to improve factor loading distribution

Social Perception PCA Example

- Do you think boys who smoke cigarettes have more or less friends?
- Do you think girls who smoke cigarettes have more or less friends?
- Do you think smoking cigarettes help people feel more or less comfortable at celebrations, parties, or in social gatherings?
- Do you think smoking cigarettes makes boys look more or less attractive?
- Do you think smoking cigarettes makes girls look more or less attractive?
- When you see a man smoking, what do you think of him?
- When you see a woman smoking, what do you think of him?

Social Perception PCA Example

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.0185	0.7655	0.2884	0.2884
2	1.2529	0.2206	0.1790	0.4673
3	1.0324	0.1621	0.1475	0.6148
4	0.8702	0.1296	0.1243	0.7391
5	0.7407	0.0918	0.1058	0.8450
6	0.6488	0.2124	0.0927	0.9376
7	0.4365	.	0.0624	1.0000

Scree Plot
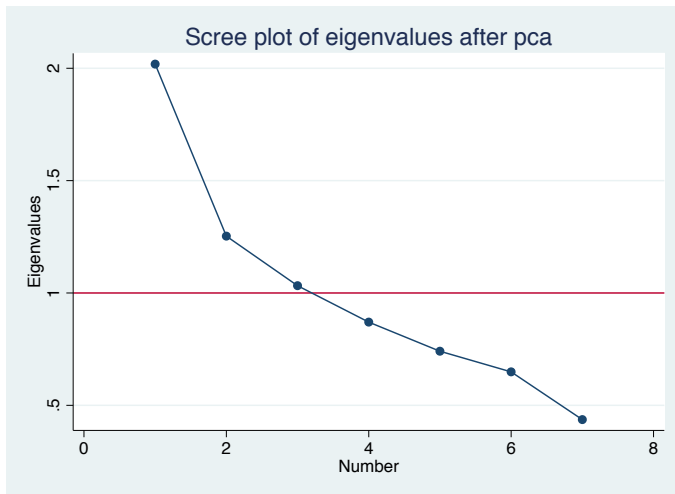
Unrotated Principal Components, eigenvectors

Variable	Comp1	Comp2	Comp3	Unexplained
1	0.453		-0.5496	0.2738
2	0.4539		-0.5197	0.3052
3	0.3413			0.7417
4	0.4873		0.4404	0.3111
5	0.4747		0.4613	0.325
6		0.695		0.3738
7		0.711		0.3657

Note: Blanks are abs(loading)<.3.

Principal Component, eigenvectors, orthogonal varimax rotation

Variable	Comp1	Comp2	Comp3	Unexplained
1		0.7120		0.2738
2		0.6901		0.3052
3	0.3494			0.7417
4	0.6618			0.3111
5	0.6603			0.3250
6			0.7019	0.3738
7			0.7102	0.3657

Note: Blanks are abs(loading)<.3.

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Independence of Irrelevant Alternatives

The odds of a particular choice are unaffected by the presence of additional alternatives.

$$\frac{P_{1i}}{P_{2i}} = \frac{exp(\mathbf{x}_{1i}'\beta_j)\big/ \sum\limits_{i=1}^{m} exp(\mathbf{x}_i'\beta_j)}{exp(\mathbf{x}_i'\beta_j)\big/ \sum\limits_{i=1}^{m} exp(\mathbf{x}_{2i}'\beta_j)} = \frac{exp(\mathbf{x}_{1i}'\beta_j)}{exp(\mathbf{x}_{2i}'\beta_j)}$$

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This is particularly a problem when alternatives are considered substitutes for each other.

Example: Red Bike, Blue Bike

Pony	Blue Bike		Ratio
2/3	1/3	—	2:1

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Example: Red Bike, Blue Bike

Pony	Blue Bike	Red Bike	Ratio
2/3	1/3	—	2:1
4/6	1/6	1/6	

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Example: Red Bike, Blue Bike

Pony	Blue Bike	Red Bike	Ratio
2/3	1/3	—	2:1
4/6	1/6	1/6	4:1

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Example: Red Bike, Blue Bike

Pony	Blue Bike	Red Bike	Ratio
2/3	1/3	—	2:1
4/6	1/6	1/6	4:1
2/4	1/4	1/4	2:1

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Example: Red Bike, Blue Bike

Pony	Blue Bike	Red Bike	Ratio
2/3	1/3	—	2:1
4/6	1/6	1/6	4:1
2/4	1/4	1/4	2:1

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Hence we overestimate the probability of selecting either bike and underestimate the probability of selecting the pony.