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Evaluating effects of BCC activities on net use in Zambia:

A propensity score analysis using the 2010 Zambia Malaria Indicator Survey

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Background

- Continued skepticism regarding the effectiveness of BCC for malaria prevention
- Recent analyses of two datasets provided mixed evidence of effect
  - Liberia 2008: positive effect on net use
  - Uganda 2009: no effect on net use
  - Level of BCC activities in each country not well known

Analysis of 2010 Zambia MIS

- May provide a more realistic assessment of BCC effectiveness

- Follows 3 years of substantial BCC activities promoting bed net use

Methodology

- Categorize individuals based on self-reported exposure to BCC messages about malaria
- Use propensity scores to match exposed and unexposed individuals based on measured background characteristics
- Use simultaneous equations to assess likelihood of unmeasured confounders
- Approach mimics an experimental design

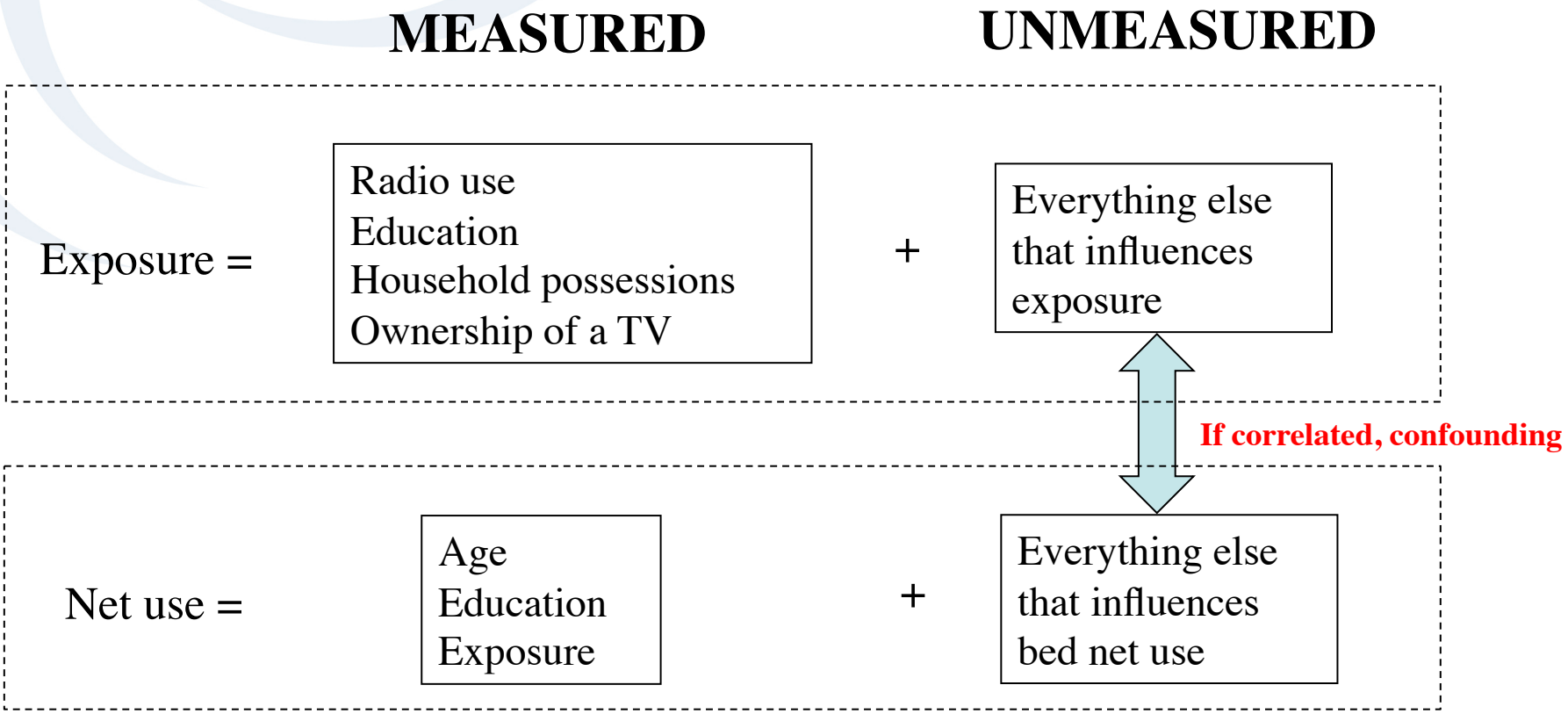
Propensity scores are used to match similar exposed and unexposed

- Propensity score = an individual's likelihood of being exposed, based on background characteristics (e.g. age, education, etc.)
- Use a regression model to calculate each respondent's propensity score
- Match exposed and unexposed respondents with the same propensity score
  - This matching removes possibility that these variables confound the exposure-outcome relationship

We still need to see if any unmeasured confounders are present

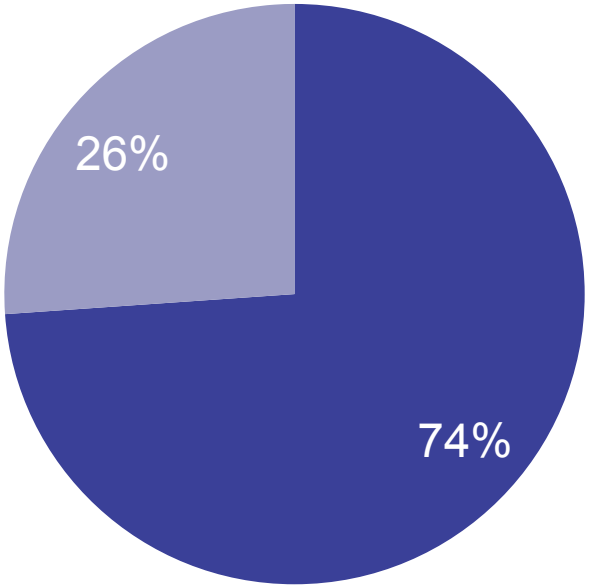
- Estimate two regression models simultaneously
  - One that predicts exposure (the propensity score model)
  - One that predicts the outcome
- Each regression model has a residual term that contains all unmeasured influences
- Correlation between the two residual terms indicates presence of a confounder

What do these models look like?

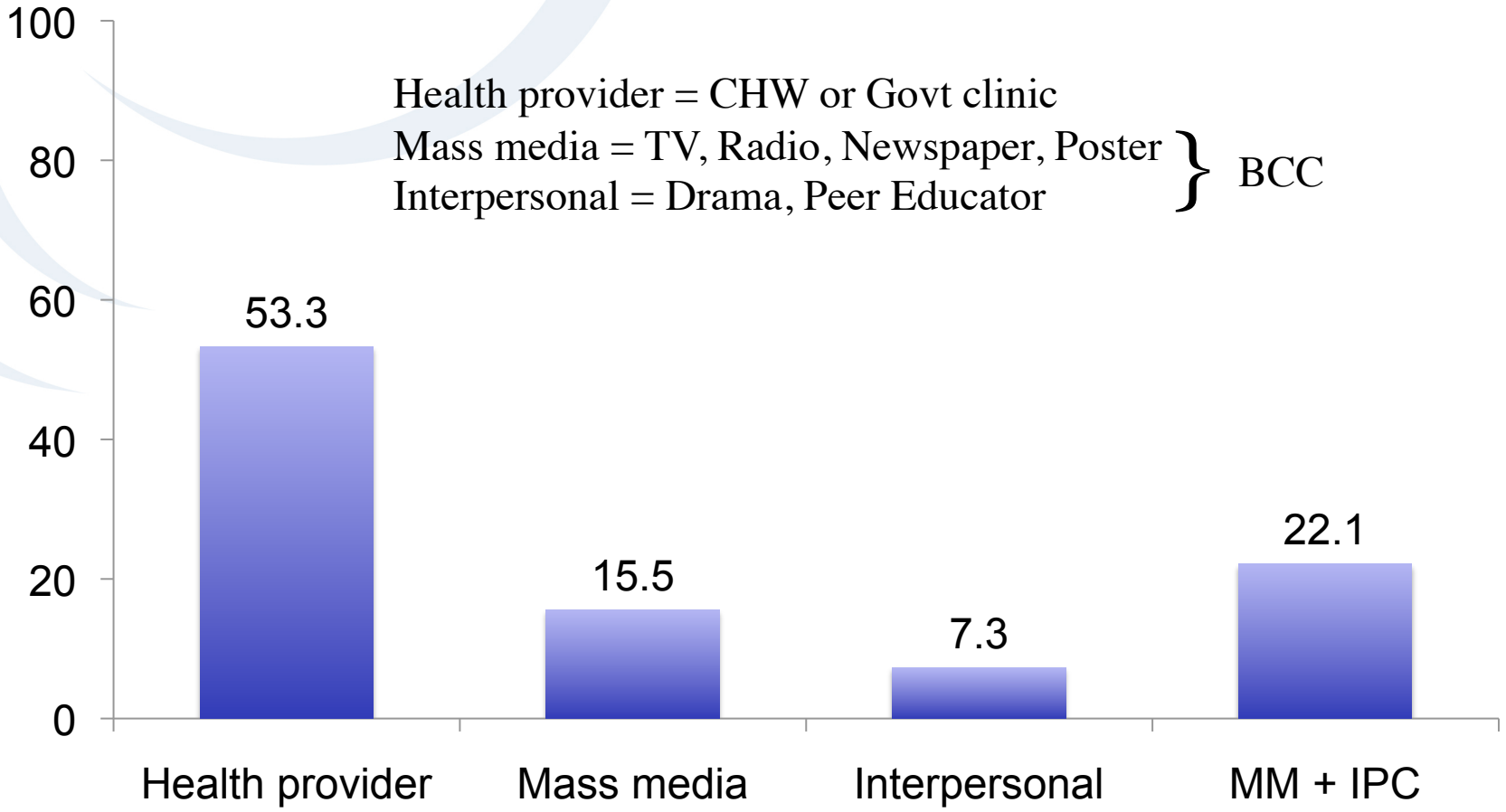


The outcome for this analysis

% of women sleeping under an ITN the previous night in HHs with at least one net



Percent of women reporting exposure to malaria-related information, by channel



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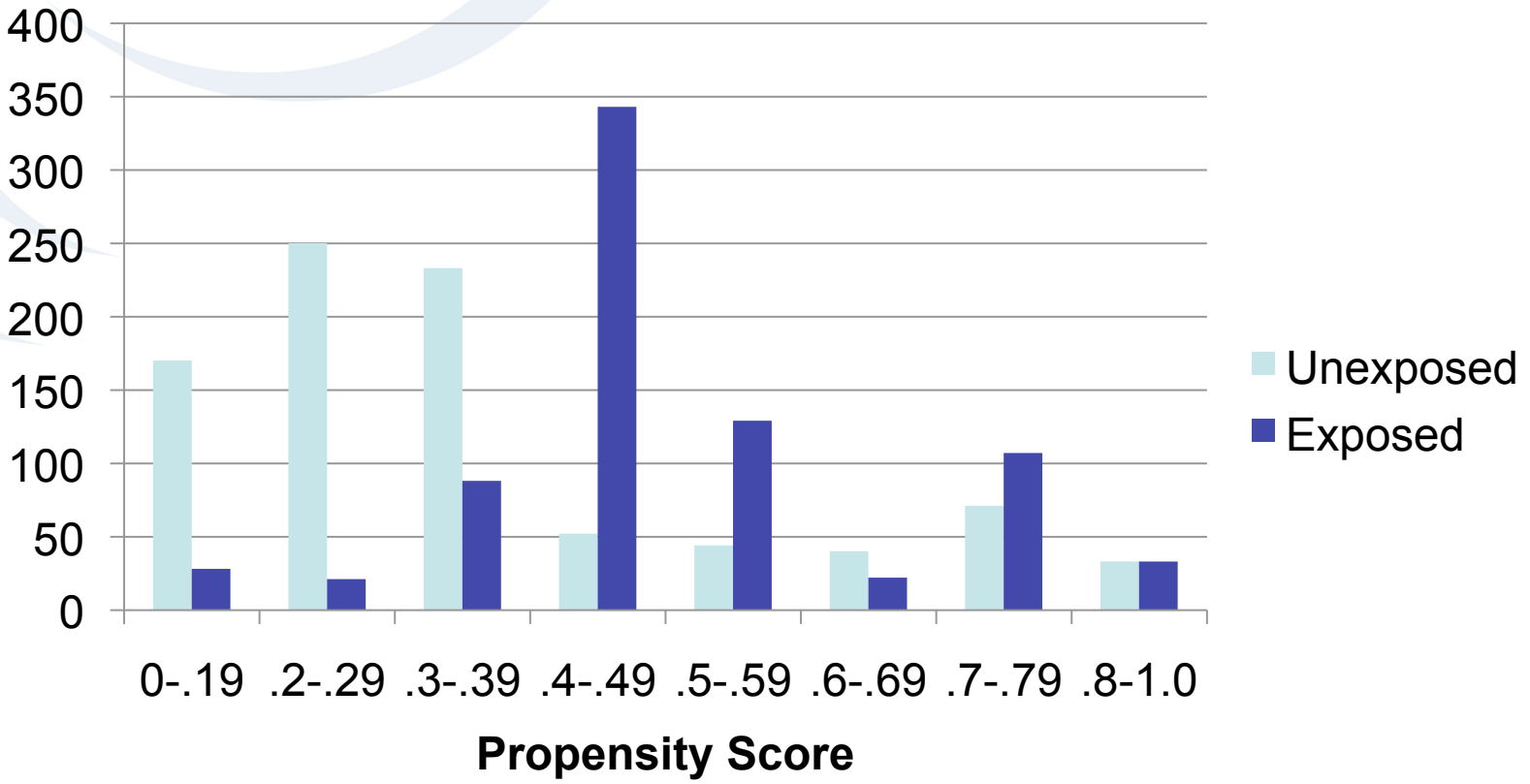
What factors did we match on?

Categories	Variables
Demographic	Age Has a child under the age of 6
Education	Number of years of education
Socioeconomic status	Wealth quintile calculated from household possessions
Location	Province of residence Urban/rural residence IRS District

*These 6 variables accounted for 35% of variance of exposure

Frequency distributions of propensity scores, by exposure status



Comparison of covariates by exposure status with and without matching

	Prior to Matching			Following Matc		
	Exposed	Unexposed	p-value	Exposed	Unexposed	p-valu
Agecat2	0.22	0.42	0.001	0.21	0.21	0.9
Agecat3	0.32	0.34	0.415	0.33	0.33	1.00
Educ 2	0.36	0.52	0.001	0.36	0.36	1.00
Educ 3	0.64	0.16	0.001	0.63	0.63	1.00
Newprov2	0.29	0.44	0.001	0.30	0.31	0.95
Newprov3	0.04	0.13	0.001	0.03	0.04	1.00
Newprov4	0.35	0.35	0.863	0.36	0.36	1.00
Child6	0.60	0.66	0.003	0.60	0.60	1.00
Wealthcat	0.65	0.47	0.001	0.66	0.66	0.95
IRS_district	0.84	0.89	0.001	0.86	0.86	1.00
Urban3	0.29	0.17	0.001	0.28	0.28	0.95

Nearest neighbor matching
With replacement
Caliper = 0.005

Used a two-equation system to identify presence of any other confounders

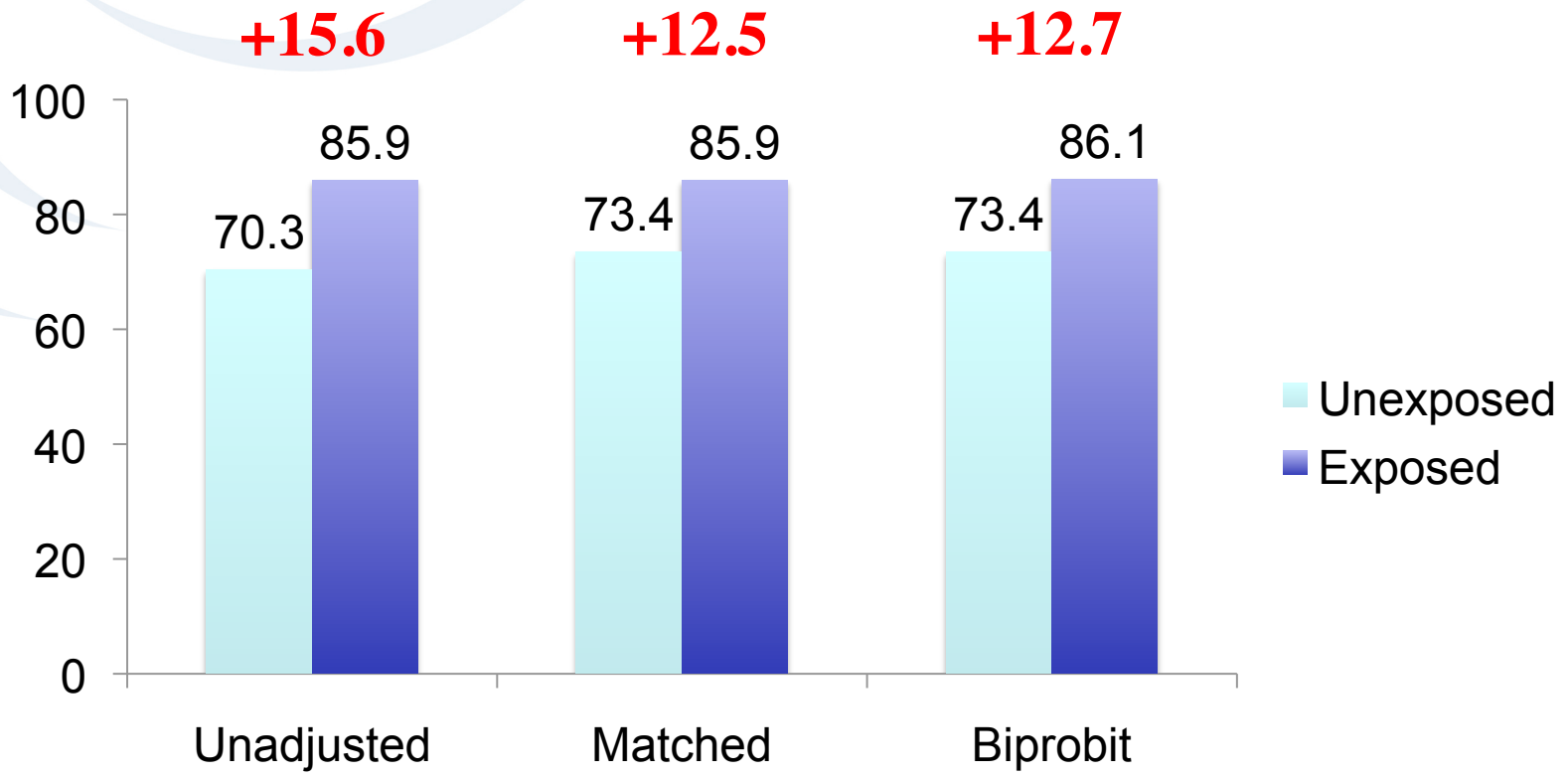
- Exposure = Constant + Measured Covariates + $Residual_E$
- Behavior = Constant + Exposure + $Residual_B$

- rho = correlation between $Residual_E$ and $Residual_B$
- If rho = 0, indicates no unmeasured confounding
  - Estimate of rho = 0.
  - Test that rho ≠ 0: p = 0.656

Biprobit regression model predicting ITN use the previous night

	Coefficient	SE	p-value
SLEPT UNDER AN ITN LAST NIGHT			
Number of nets in Household (Ref = 1)			
2 nets	0.11	0.08	0.159
3 or more nets	1.22	0.08	0.001
Received malaria information from a Health Worker	1.16	0.06	0.001
Exposed to malaria information from BCC	0.44	0.11	0.001
Constant	-0.57	0.08	0.001
EXPOSED TO MALARIA INFORMATION FROM BCC			
Age (Ref = 15-24)			
25-34 years old	-0.01	0.09	0.976
35-49 years old	1.32	0.11	0.001
Education (Ref = None)			
Primary	2.11	0.16	0.001
Secondary or Higher	3.81	0.19	0.001
Upper 2 wealth quintiles	-0.60	0.09	0.001
Province (Ref: Central,Copperbelt)			
Eastern, Northern, Luapula	-0.76	0.10	0.001
Lusaka	-0.32	0.16	0.044
Western. Southern, NorthWestern	-0.59	0.09	0.001
Has a child under the age of 6	-0.58	0.08	0.001
Lives in a district that received IRS	-0.36	0.10	0.001
Lives in an urban area	0.03	0.12	0.772
Constant	-2.14	0.20	0.001
Correlation between residuals	0.035	0.08	0.6561

Percent of women sleeping under an ITN the previous night among HHs that own a net, by exposure to BCC



All differences significant (p<0.001)

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Conclusions

- Exposure to BCC increased net use among women by 12 percentage points
  - Controlling for the number of nets in HH and
  - Controlling for HW exposure (which had an even larger effect)

- Unclear why reach of media was relatively low