



# The Essential BCC Indicator for Malaria Prevention and Treatment: % exposed to malaria messages

Marc Boulay, PhD

March 30, 2011



# Recommended questions (used in Liberia MIS)

QUESTIONS	CODING CATEGORIES*
In the past few months, have you seen or heard any messages about malaria?	YES NO
What messages about malaria have you seen or heard?	IF HAVE A FEVER, GO TO HEALTH FACILITY SLEEP UNDER MOSQUITO NETS PREGNANT WOMEN SHOULD TAKE DRUGS TO PREVENT MALARIA MALARIA KILLS OTHER_____
Where did you hear or see these messages?	RADIO BILLBOARD POSTER T-SHIRT LEAFLET/FACTSHEET COMMUNITY HEALTH WORKERS COMMUNITY EVENT

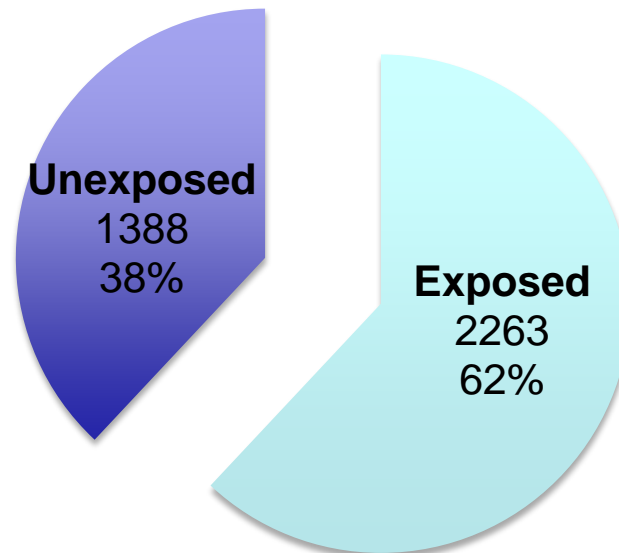
**\*Coding categories may need to be adapted to specific setting**

# Uses of these questions

- Measure reach of BCC activities
  - Overall
  - By message
  - By channel
  
- Evaluate effect of BCC on behaviors

# Measuring Reach: Self-reported exposure to malaria-related messages

Number and Percent of women with a child under 5 who reported hearing or seeing any message about malaria in the past few months, Liberia 2009



# Assessing effect: Approximating the counterfactual condition

- Counterfactual compares two states for the same person
  - Behavior when person A is exposed
  - Behavior when person A is unexposed
- Experimental designs approximate the counterfactual condition
  - Due to randomization, exposed group is identical to the unexposed group
  - Difference between groups = effect of program

# Basic approach for evaluating national-level BCC programs

- Use individuals' self-reports to identify exposed and unexposed groups
  - Difference in the outcome behavior between two groups may be the effect of the program
- Caveat: Self-selection, not randomization, used to form groups

# Propensity score matching mimics experimental design

- Use exogenous variables to calculate propensity to be exposed
- Match exposed and unexposed individuals with similar propensities
- Treatment effect is the difference between matched exposed and unexposed individuals
- Assumes you have matched on **all** potential confounders

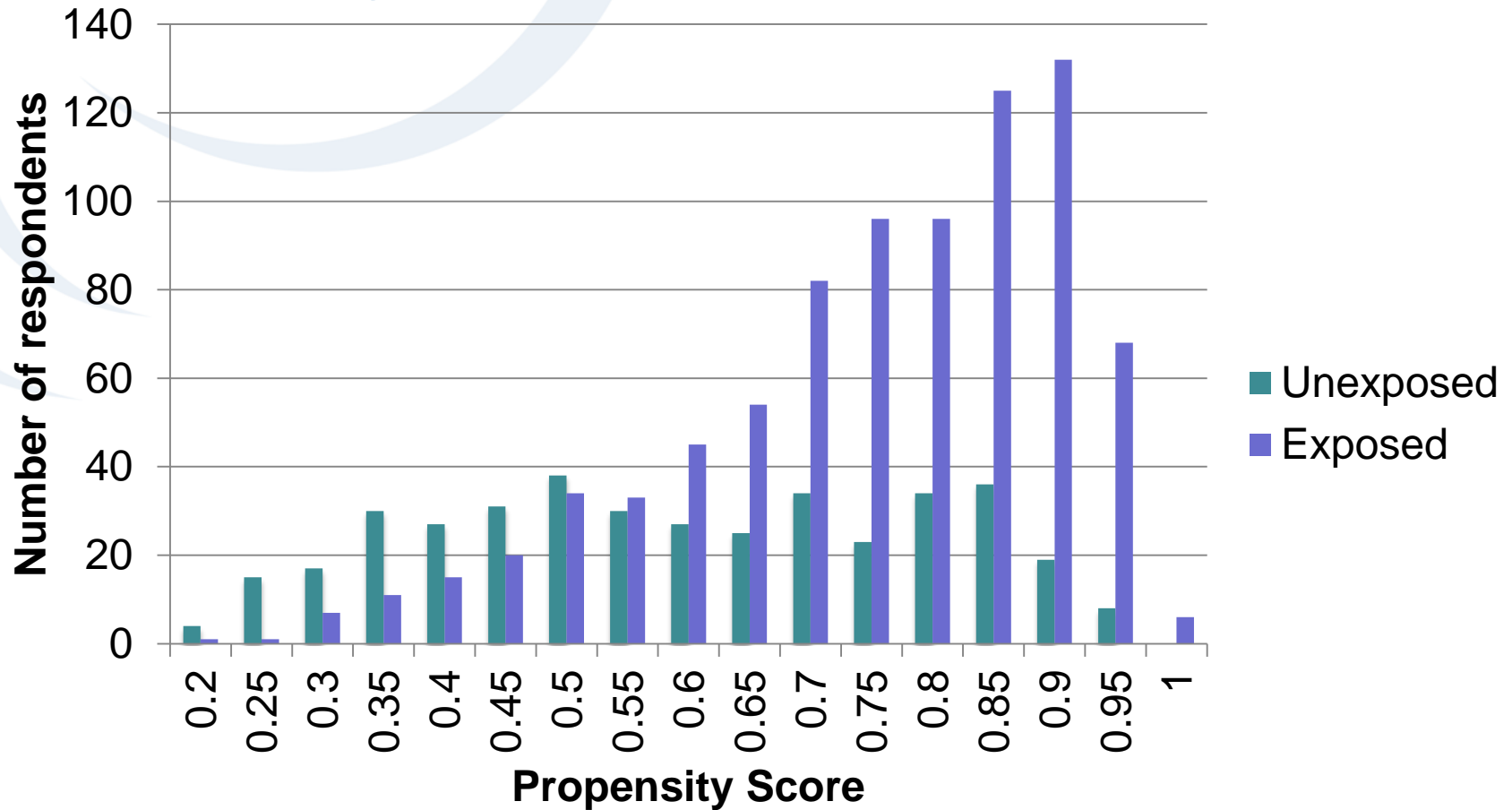
# Logit regression model predicting exposure to malaria messages

	Coefficient	SE	z	p-value
Age (in years)	.1427868	.0553045	2.58	0.010
Age <sup>2</sup>	-.0019846	.0009512	-2.09	0.037
Education completed (years)	.0016115	.0063472	0.25	0.800
Able to read a complete sentence	.5670394	.1543103	3.67	0.000
Live in an urban location	.3442702	.1694423	2.03	0.042
Obtain water from a protected well	-.1849731	.1657717	-1.12	0.264
Household has no toilet	-.1780133	.1570896	-1.13	0.257
Household has electricity	-.3280451	.4213552	-0.78	0.436
Household has a radio	.0965217	.1487582	0.65	0.516
Household has a television	.1187214	.2708416	0.44	0.661
Household has a bicycle	.2391031	.3400521	0.70	0.482
Household has a motorcycle	.6381442	.26967	2.37	0.018
Household has a car	.7014485	.5563066	1.26	0.207
Household has an earthen floor	.3223357	.1635853	1.97	0.049
Northwestern Region	.5999894	.3142379	1.91	0.056
South Central Region	-.1029083	.2995301	-0.34	0.731
South Eastern Region	-.4243122	.2409395	-1.76	0.078
North Central Region	.8033171	.2913152	2.76	0.006
Bassa	.8314149	.2551008	3.26	0.001
Grebo	-.6368474	.2191132	-2.91	0.004
Kpelle	.4361142	.2517741	1.73	0.083
Kru	-.4387777	.2395026	-1.83	0.067
Christian religion	.0605946	.2564565	0.24	0.813
Number of adults in HH	-.0660762	.0251445	-2.63	0.009
Number of children under 5 in HH	.0832062	.0576064	1.44	0.149
Constant	-1.821667	.8331883	-2.19	0.029

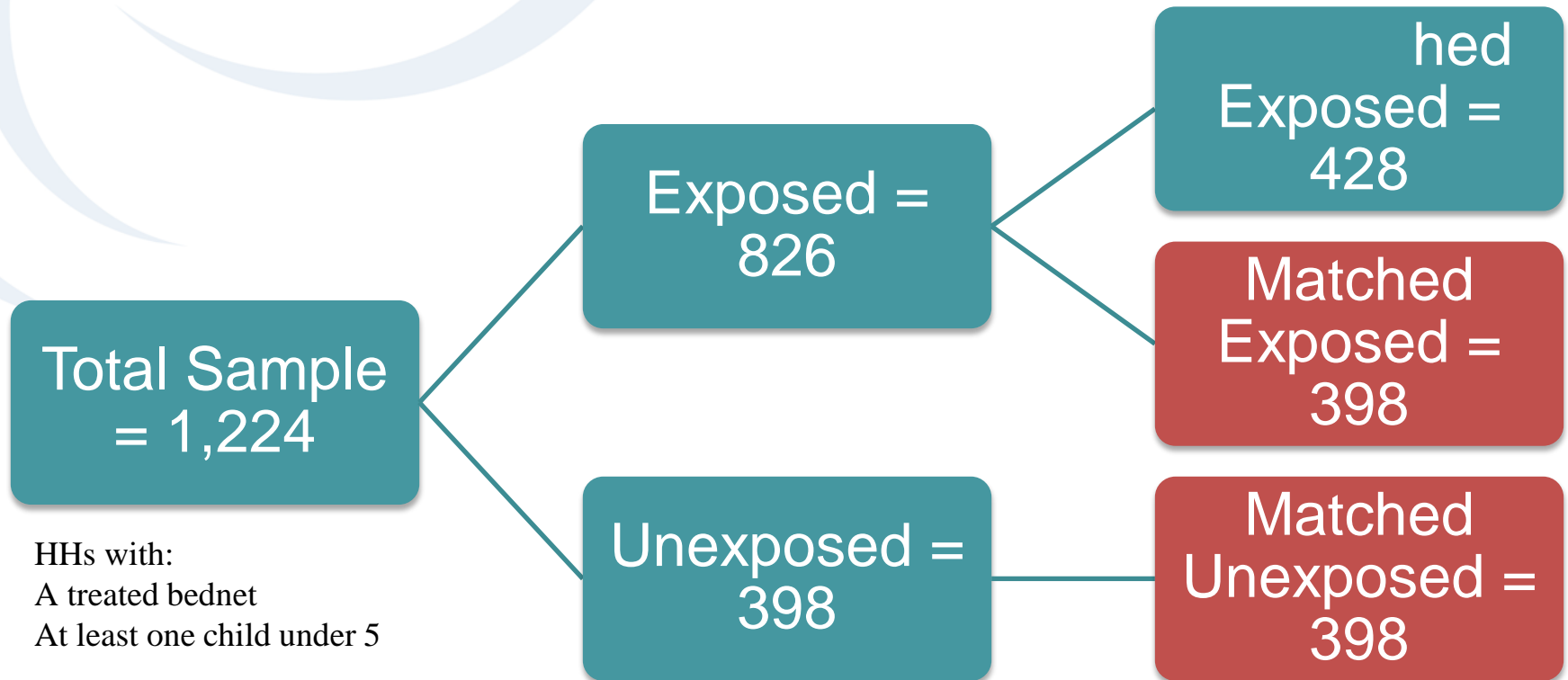
**This equation is used to calculate each person's propensity score**



# Frequency distributions of propensity scores, by exposure status



# One to One Nearest Neighbor matching based on propensity score

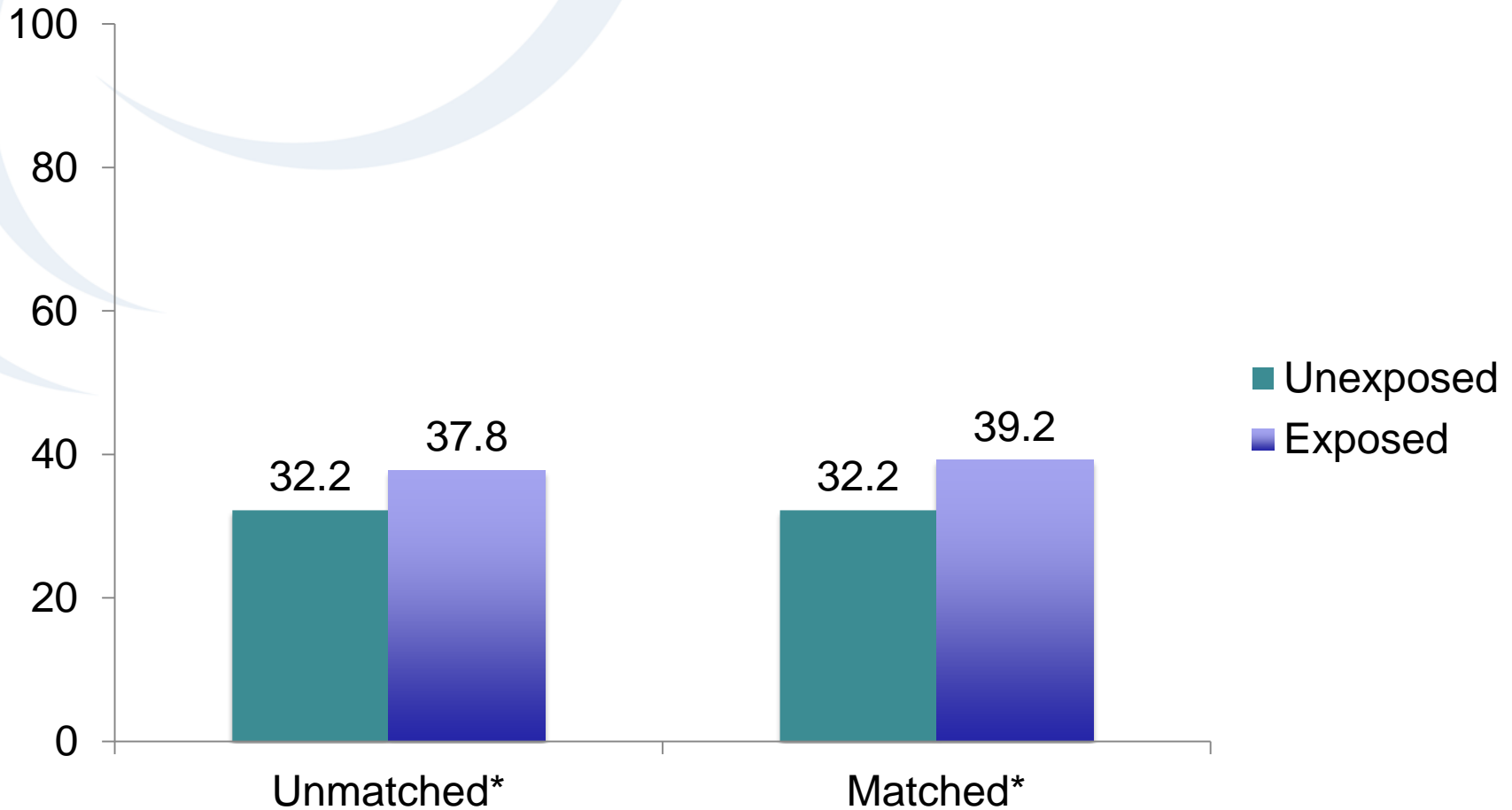


# Comparison of covariates by exposure status with and without matching



	Prior to Matching			After Matching		
	Exposed	Unexposed	p	Exposed	Unexposed	p
Age (in years)	26.70	24.91	0.00	25.08	24.91	0.78
Age2	785.18	691.36	0.00	696.97	691.36	0.87
Education completed (years)	7.18	6.03	0.10	5.88	6.03	0.82
Able to read a complete sentence	0.52	0.38	0.00	0.41	0.38	0.28
Live in an urban location	0.60	0.54	0.03	0.56	0.54	0.48
Obtain water from a protected well	0.71	0.71	0.92	0.70	0.71	0.70
Household has no toilet	0.32	0.35	0.23	0.35	0.35	0.82
Household has electricity	0.03	0.03	1.00	0.04	0.03	0.85
Household has a radio	0.64	0.56	0.00	0.59	0.56	0.35
Household has a television	0.13	0.08	0.02	0.09	0.08	0.62
Household has a bicycle	0.06	0.04	0.15	0.04	0.04	0.86
Household has a motorcycle	0.10	0.06	0.05	0.08	0.06	0.49
Household has a car	0.03	0.01	0.05	0.01	0.01	0.74
Household has an earthen floor	0.49	0.50	0.60	0.47	0.50	0.36
Northwestern Region	0.11	0.07	0.05	0.09	0.07	0.51
South Central Region	0.09	0.08	0.49	0.10	0.08	0.31
South Eastern Region	0.34	0.59	0.00	0.55	0.59	0.22
North Central Region	0.26	0.11	0.00	0.06	0.11	0.23
Bassa	0.16	0.08	0.00	0.08	0.08	0.90
Grebo	0.14	0.33	0.00	0.27	0.33	0.31
Kpelle	0.16	0.08	0.00	0.06	0.08	0.32
Kru	0.10	0.18	0.00	0.18	0.18	0.85
Christian religion	0.91	0.92	0.49	0.90	0.92	0.22
Number of adults in HH	5.87	6.24	0.05	6.09	6.24	0.50
Number of children under 5 in HH	2.14	2.06	0.31	2.01	2.06	0.61

# Percent of households where all children under 5 slept under a net the previous night



Among net-owning households

\* $p < 0.05$

# Assessing the potential for unmeasured confounding

- Approach A: A two-equation system
  - Exposure = Constant + Measured Covariates + Residual<sub>E</sub>
  - Behavior = Constant + Exposure + Residual<sub>B</sub>
  - rho = correlation between Residual<sub>E</sub> and Residual<sub>B</sub>
  - If rho = 0, indicates no unmeasured confounding
- Approach B: A two-step approach
  - Exposure = Constant + Measured Covariates + Residual<sub>E</sub>
  - Behavior = Constant + Exposure + Residual<sub>E</sub> + Residual<sub>B</sub>
  - If Residual<sub>E</sub> = 0, indicates no unmeasured confounding

# Tests of potential confounders

Test	Value	P-value
Rho $\neq$ 0	0.223	0.318
Residual <sub>E</sub> $\neq$ 0	0.223	0.299

# Conclusions

- These three questions provide valuable data for evaluating BCC programs
- They don't inform decisions on message development
- These analyses also suggest BCC programs do increase net use