Estimating hunting prevalence and reliance on wild meat in Cambodia's Eastern Plains

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SUPPLEMENTARY MATERIAL 1 Verbal consent script read to participants before commencing questionnaire. Interviews only continued if participants voluntarily consented to proceed.

Hello. My name is [Research Assistant Name] and I am helping Harriet Ibbett, an independent researcher from the University of Oxford in the UK, to conduct some research here in Seima. Harriet is investigating the reliance of local people on resources collected from the forest. The research focuses on the importance of forest resources for local people's livelihoods, and how law enforcement affects access to these resources.

I would like to ask you to participate in a survey, which will ask you about the activities of your household. The survey will take approximately 60 minutes, and will involve two exercises. During one of the exercises you will be asked to consider a set of choices, and asked to make decisions about which option you prefer the most i.e. which option you think is best for you.

There are no serious risks associated through your participation in this questionnaire. All information shared with me will be saved in a secure database which can only be accessed by Harriet, using a password. At the end of the research, Harriet will write a report on her findings, the information of which will be used by WCS and the Government to help communities improve the protection of their forest resources. Please note that we are conducting independent research, i.e. we are independent of the government and WCS, and thus we have neutral views with regard to forest use and forest policies. We also reassure
you that your answers will not be communicated to anyone in a form where your reply can be linked to you. Any information I pass on will be at a general level; I will never identify individuals, use names, or identify specific villages. Some results may also be published internationally in academic journals, or presented at conferences or online blogs.

All the information you provide will be completely anonymous. I will not record your name, or any information that can personally identify you or your household. At times, you may feel discomfort at some of the topics we discuss, you do not have to answer any questions that you do not want. If you would like to skip a question or a topic, please just let me know. Participation is completely voluntary, you may refuse to answer or stop participating at any time, without having to explain yourself and your responses will be discarded.

This study has been reviewed by, and received ethics clearance through the University of Oxford CUREC. I also have permission of the Ministry of Environment, the Commune Chief and the Village Chief to carry out this research in your village. If you have any concerns about this project, please speak to Harriet and she will do her best to answer your query.

NOTE TO INTERVIEWER: *For the purpose of this survey a HOUSEHOLD is defined as 'an economic unit that shares their wealth'. This should include household members that live away and send back money to the household.*

Would you be willing to participate in the survey? Yes / No

If no, record reason in notebook with date, village and house number. Then move on to the nearest household.

Are you happy for your responses to be recorded? Yes / No

SUPPLEMENTARY MATERIAL 2 Questionnaire, targeted at any available respondent above the age of 18 in households selected via systematic random sampling.

Data were collected electronically using tablets, with paper datasheets used in emergencies in case of tablet power failure.

[Before approaching respondent, remember to flip coin & ID which UCT card set to use, A or B]

Start time: _____ **No. people present at the start:** _____ **Interview ID:** _____

Location Information

Interviewer *(circle):* **HI Present?** Yes / No **Date**: ___ / ___ /18

Village: *(circle)*

READ CONSENT SCRIPT

Would you be willing to participate in the survey? **Yes / No**

If no, record reason in notebook with Interview ID. Move to the next household.

Are you happy for your responses to be recorded? **Yes / No**

1. Respondent Demographics

1.1 Gender: Male / Female **1.2** Age: _____ **1.3** Years lived in village: _____

1.4 Ethnicity: Bunong / Khmer / Stieng / Vietnamese / Other:_____

1.5 Education: Grade: _____ *(circle)* None / Primary / Secondary / College / University

1.6 Head of Household? Yes / No **1.6a** If no, status: _____

2. Household Information *'an economic unit that shares their wealth'. Only include people living in HH.*

2.1.a No. in HH: _____ **2.1.b** No. men in HH +16: _____

2.2 Main source of income in household: _____

Does the household own any of the following:		0	1	2	3	4
2.3a	Material of house roof	Palm	Timber	Zinc	Tiles	
2.3b	Material of house walls	Palm	Bamboo/ Metal	Timber	Brick	Concrete
2.3c	Does the household have electricity?	No	Battery	Solar	Mains	
2.3d	Does the household own a moto?	No	Yes	**2.3d2** How many?		
2.3e	Does the household own any cows/buffalo?	No	Yes	**2.3e2** How many?		
2.3f	Does the household own a mobile phone?	No	Yes	**2.3f3** How many?		
2.3g	Does the household own a TV?	No	Yes			
2.3h	Does the household own a Ko-yun?	No	Yes			

2.3i	Does the household have any dogs?	No	Yes	**2.3.i** How many?	

h

2.3j *(Calculate after the interview)* Wealth ranking score: | / 13 |

	Own & Rent
2.4 How many **ha** of **rice** does your household farm?	
2.5 How many **ha** of **cassava** does your household farm?	
2.6 How many **ha** of **cashew** does your household farm?	

2.7   Does your household own any resin trees**?** *(circle)*   Yes / No   / Rent

2.7.a   How many resin trees does your household own or rent?

2.7.b   Does your household still collect resin? *(circle)*   Yes / No

2.7.c   If no, what year did you stop?   *if no, skip to 2.8*

2.7.d   How often do you collect resin? *(number)*   *(circle)* X week / month / yr / NA

2.8.a How many people in your household have paid employment?

2.8.b Who has paid employment? *(Tick all that apply)*	**2.8.c** What types of work do they do? *(Tick all that apply)*
Head of household	Daily Paid labour
Husband	Teacher
Wife	Nurse
Son	Administrator in Keo Seima
Daughter	Government worker
Niece	Work with WCS
Nephew	Ranger / patrol
NA	NA
Other:_____.	Other:_____.

3. Forest Activities

3.1 Does anyone in your household collect resources from the forest? *(circle)*   Y / N

3.1a If no, why not? _____

_____ *skip to section 4*

3.1b if yes, who usually goes? _____

3.2 How often do they usually go to the forest in **dry** season? *(enter number, then circle frequency)*

          x week / x month / x year / NA

3.2 How often do they usually go to the forest in **wet** season? *(enter number, then circle frequency)*

          x week / x month / x year / NA

3.3. When they go to the forest do they usually *(circle all)*

          walk / moto /   ko-yun   / cassava truck / other:_____ / NA

3.4 When they go to the forest, do they usually go *(circle)*

alone / with household member / with 1 other not from household / In group / NA

3.5 If they go to the forest, do they go with dogs? *(circle)*

Always / Sometimes / Never / Don't know / NA

4. UCT

- *I'd now like to do a short exercise with you. I will show you a card.*
- *On this card will be some pictures that represent items your household may or may not do.*
- *I would like you to tell me how many of the items are relevant to your household.*
- *It is very important you do not tell me which items, but only how many.*
- *First, we will try a practice question. This is about different fruits you might eat in your household.*

UCT SET: A or B

PRACTICE: In the **last week**, how many of the following items of fruit have people in your household eaten?

NOTE to Interviewer: Repeat this process until respondent understands

4.1a Card: Control / Treatment   **4.1b** Number: [   ]

4.1c How many times did you have to explain the UCT? [   ]

4.2 UCT CARD 1

This question is about things you collect to eat. In the last 12 months, how many of the following items have people from your household **collected to eat?**

4.2a Card: Control / Treatment   **4.2b** Number: [   ]

4.3 UCT CARD 2

This is about things people from your household might take to collect resources. In the last 12 months, how many of the following items have people from your household **taken with them to collect resources?**

4.3a Card: Control / Treatment   **4.4b** Number: [   ]

4.4 UCT CARD 3

This question is about livelihood activities your household may do. In the last 12 months, how many of the following **livelihood activities** have people from your household done?

4.4a Card: Control / Treatment   **4.6b** Number: [   ]

4.5 UCT CARD 4

In the last **12 months**, how many of the following items have people from your household **collected to eat**?

4.5a Card: Control / Treatment   **4.3b** Number: [   ]

4.6 UCT CARD 5

In the last **12 months**, how many of the following items have people from your household **taken with them to collect resources**?

4.6a Card: Control / Treatment   **4.5b** Number: [   ]

4.7 UCT CARD 6

In the last **12 months**, **livelihood activities** have people from your household done?

4.7a Card: Control / Treatment   **4.7b** Number: [   ]

Tell me whether you agree or disagree with a few statements about the exercise *(circle response)*

4.8   I understood what I had to do   *Agree / Disagree / Neither*

4.9   I felt comfortable answering questions honestly   *Agree / Disagree / Neither*

4.10 I found this method confusing   *Agree / Disagree / Neither*

4.11   I believe the interviewer knows which activities my household does

Agree / Disagree / Neither

5. Wildlife reliance – *These questions are about how much your household relies on wildlife*

5.1.a How often does your household eat wild meat meals in **dry** season?

| | X per week / month / yr

5.1.b How often does your household eat wild meat meals in **wet** season?

| | X per week / month / yr

5.2 Where does your household get wild meat to eat? *(tick all they mention)*

☐ Buy from market   ☐ Catch around chamkar   ☐ Neighbour shares

☐ Buy in village   ☐ Catch in forest   ☐ Don't eat wild meat

5.3 What species does your household eat most often? *(tick all they mention)*

☐ Wild pig   ☐ Gaur   ☐ Jungle chicken

☐ Muntjac   ☐ Civet   ☐ Other:

☐ Sambar   ☐ Rice monkey   ☐ NA

☐ Banteng   ☐ Turtle

☐ Mouse deer   ☐ Monitor Lizard

5.4.a What type of meat does your household most prefer to eat? *(circle)*

Domestic   / Wild / No answer

5.4.b Why? _____

5.5 Do people in your household ever use wildlife for medicine? *(circle)*   *Yes / No*

if no, skip to section 6

5.6 If yes, what species? *(tick all they mention)*

☐ Slow loris   ☐ Hornbill

☐ Pangolin   ☐ Civet

☐ Porcupine   ☐ Snake / Cobra

☐ Gibbon   ☐ Other:

☐ Douc   ☐ NA

☐ Tortoise

5.7 Where does your household get wildlife for medicine from? *(circle all)*

Buy from market / buy in village / order from hunter / catch around chamkar / catch in forest /

Don't use

6. Forest Animals

Now I will show you some pictures of animals that live in the forest.

a) Did they correctly ID the animal?

b) How often do you see this animal?

0 = Never

1 = Very rarely e.g. once or twice in last few years

2 = Sometimes e.g. once or twice a year

3 = Often e.g. every few weeks

4 = Very often e.g. every day to every week

c) In last 5 years, do you think the number of these animals living in the forest has:

=↓Decreased   =➡No change   =↑Increased   DK = Don't know

d) Is this animal protected?

Q#	Species	. ID	. Sightings	Pop	d. Protection
6.1	Muntjac	Y / N			Y / N / DK
6.2	Pangolin	Y / N			Y / N / DK
6.3	Douc	Y / N			Y / N / DK
6.4	Peafowl	Y / N			Y / N / DK
6.5	Banteng	Y / N			Y / N / DK
6.6	Gibbon	Y / N			Y / N / DK

6.7.a Do you ever have problems with wildlife around your chamkar? *(circle)*   Yes / No / NA

if No or NA, skip to Section 7

6.7.b If yes, what species? *(tick all)*

☐ Rice monkey   ☐ Elephant   ☐ Other:

☐ Wild pig   ☐ Porcupine   ☐ NA

☐ Muntjac   ☐ Bamboo Rat

6.7.c How do you protect your crops? *(tick all)*

☐ *Use snare*   ☐ *Scarecrow*   ☐ *Other*

☐ *No protection*   ☐ *Burn bad smells*

☐ *Sleep at night*   ☐ *Fence*

If use snares: *if no, skip to Section 7*

6.7.d How many snares does your household set around chamkar?   _____

7. Changes in Hunting Behaviour

In the last 5 years, in your opinion has the: *(tick one box)*	Increased	Decreased	No change	Don't know	No answer	Don't have in village
7.1 Consumption of wildlife by villagers						
7.2 Sale of wildlife in village						
7.3 Hunting by villagers						
7.4 Hunting by people outside the village						

7.5 Why do you think these changes have happened?   *DK*

_____

_____

7.6 Who do you think goes the most to hunt wildlife in the forest?   *DK* _____

7.7 In what season do you think people catch wildlife the most? *(circle one)*

Wet season / Dry season / Don't know

8. Direct Questions

We are now near the end, and I have a few more questions for you, these are about your household's collection of wildlife. Please remember, you do not have to answer any questions you do not want, and you are free to finish the interview at any time.

8.1.a Have people in your household ever caught wildlife from the forest? *(Circle)*

Currently   /   No   /   Used to   /   Do not wish to answer

8.1.b If no, why not? _____

_____*then skip to section 9*

8.1.c If used to, when did they stop? *(year e.g. 2014)* [   ]

8.1.d If used to, why did they stop? _____

8.2.a How often does your household go to catch wildlife? [   ] *(circle)* X per week / month / yr

8.2.b What methods does your household use/used use to catch wildlife? *(Tick all that apply)*

a	☐ Snare in forest
c	☐ Dogs
d	☐ Slingshot
e	☐ Gun
f	☐ Cross bow
g	☐ Glue trap
h	☐ Net
i	☐ Other: _____
j	☐ Do not wish to answer

8.3 If they use snares: *(NA = if do not wish to answer) if they don't use snares, skip to 8.4*

8.3.a How many snares did/does your household set in the forest? ☐☐☐☐

8.3.b How far did/do you travel to set snares? ☐☐☐☐ Km

8.3.c How often did/does your household check forest snares? ☐ *(circle)* X per week / month

8.4 How often did/do you catch wildlife? ☐☐☐ *(circle)* X per week / month / yr

8.5 What animals did/does your household catch the most often? _____

_____

8.6 If animals got harder to catch, what would your household do? *DK*

_____

8.7 Why did/does your household catch animals? *(Circle all)*

       To eat / For medicine / To sell/for income / Do not wish to answer

9. Wildlife Rules

9.1a Are there any rules about catching wildlife*? (Circle)*   *Yes / No / Don't know*

9.1b If yes, what? _____

_____   _____

9.1.c Are you allowed to protect crops by setting snares around your chamkar? *(Circle)*

Yes / No / Don't know

If someone in the village…. (Tick one box)	V Likely	Likely	Somewhat likely	Unlikely	V unlikely	Dont know	No answer
9.2 caught wildlife, how likely is it that neighbours would know?							
9.3 caught wildlife, how likely is it that a patrol would catch them?							
9.4 was caught with wildlife, how likely is it that they would receive a penalty?							

9.5 What penalty might they receive? *(tick all, write fine amount in riel)*

☐ Fine ☐☐☐☐☐ riel   ☐ Burn meat

☐ Bribe ☐☐☐☐☐ riel   ☐ Confiscate snares

☐ Warning   ☐ Confiscate moto

☐ Confiscate meat   ☐ Arrest

☐ Send to HQ   ☐ Other:
☐ Go to prison

9.6 If someone from your household went hunting, would your friends and family *(circle one)*

Strongly disapprove   Disapprove   No opinion   Approve   Highly approve   DK   NA

9.7 Has anyone in the household ever been caught by a patrol with wildlife? *(Circle one)*

Yes   /   No   /   Do not wish to answer

If no, skip to 9.10

9.8 What happened?   *NA* _____

_____

_____

9.9 How many times has someone in your household been stopped by patrols in the last 5 years?

NA   [   ]

9.10 How worried are you about meeting patrols in the forest*? (circle one)*

Very worried   /   Worried   /   Sometimes worried   /   Not worried   /   NA

9.11 Why?   *DK* _____

_____

No. people present at end of interview: [   ]   **Finish Time:**   [   ]

SUPPLEMENTARY MATERIAL 3 Unmatched Count Technique analysis.

Prior to conducting regression analysis of UCT data, basic analysis was conducted to explore the difference in the means between control and treatment groups, using the following formula:

$$\pi^1 = \Upsilon^1 - X^1$$

where, Υ represents the mean number of items reported for the treatment group, and X represents the mean number of items reported for the control group.

To increase the sample size and reduce noise associated with large confidence intervals, a double list UCT was adopted. During a double list, each respondent is asked the same question twice, however, they are shown both a control and treatment list, featuring different control items. The prevalence estimate for the double list method is calculated using the formula below:

$$\pi^1 = \Upsilon^1 - X^1, \qquad \pi^2 = \Upsilon^2 - X^2 \quad \rightarrow \quad \pi^d = \frac{\pi^1 + \pi^2}{2}$$

where, π^1 the difference in means of the first list, and π^2 represents the difference in means for the second list.

Results show that the practice fruit question worked as expected, with a prevalence estimate 0.25 higher for the treatment group, suggesting the consumption of pineapple in households was 25%. However, for the six sensitive questions on hunting activity results show only marginal positive differences for the wire snare, and negative estimates for both collecting wild meat and selling wild meat as a livelihood activity.

Note // the overall sample size for the UCT data is 702 (rather than 705), as some responses had to be discarded as enumerator data entry error meant it was unclear whether respondents had been allocated to the control or treatment group.

SUPPLEMENTARY TABLE 3A Testing for design effects (n=702), where a Bonferroni-corrected P-value of <0.05, can be interpreted as evidence for the presence of design effects.
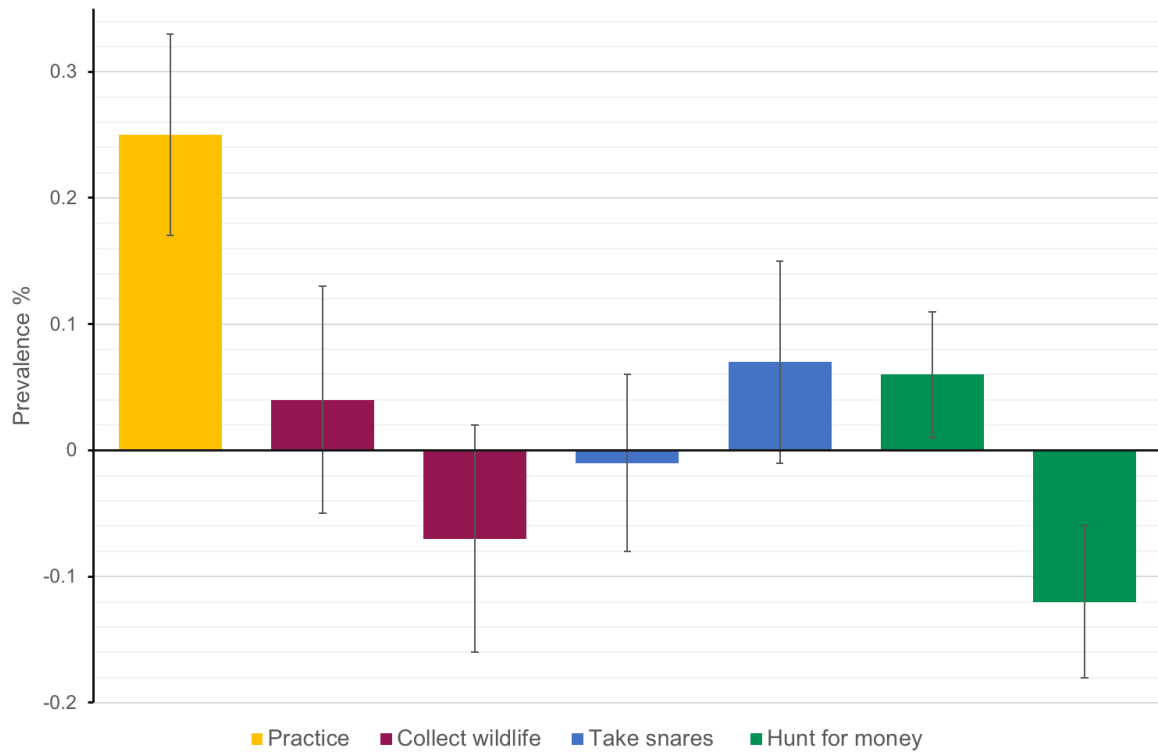
Sensitive Item	alpha	Bonferroni-corrected p-value	Outcome
Practice: pineapple	0.05	0.8711856	No design effects
List 1: Collect wild meat to eat	0.05	0.08971711	No design effects
List 2: Take wire snare to forest	0.05	0.5059299	No design effects
List 3: Collect wildlife for livelihood	0.05	0.6855584	No design effects
List 4: Collect wild meat to eat	0.05	0.1937944	No design effects
List 5: Take wire snare to forest	0.05	1	No design effects
List 6: Collect wildlife for livelihood	0.05	0.01690034	Design effects

SUPPLEMENTARY TABLE 3B Distribution of item counts for each list. Table shows presence of floor and ceiling effects (n=702), which occur when greater than expected proportion of respondents state either that none of the items on the list apply (floor) or all the items on the list apply (ceiling). Ideally, these estimates should be as close to 0 as possible.

Question	List	Card	Number of items reported by respondent												Mean number of items reported	Difference between means (prevalence estimate)
			0		1		2		3		4		5			
			n	%	n	%	n	%	n	%	n	%	n	%		
Fruit (pineapple)	Practice	Control	8	2	72	21	145	42	69	20	50	15			2.235	0.253
		Treatment	9	2	60	17	153	43	62	17	31	9	43	12	2.489	
Collect wild meat to eat	1	Control	20	5	77	21	114	32	94	26	55	15			2.25	0.04
		Treatment	15	4	83	24	130	38	57	16	26	7	34	10	2.29	
	4	Control	18	5	68	20	90	26	84	24	85	25			2.44	-0.07
		Treatment	31	9	66	19	110	30	77	21	47	13	29	8	2.37	
Take wire snare when collecting resources	2	Control	34	10	112	32	139	40	49	14	13	4			1.70	-0.02
		Treatment	45	13	101	29	148	41	53	15	9	3	>1	0	1.68	
	5	Control	34	9	119	33	132	37	49	14	27	8			1.77	0.08
		Treatment	34	10	114	33	107	31	55	16	28	8	6	2	1.85	
Collect wildlife for livelihood	3	Control	26	7	170	48	142	40	19	5	2	1			1.45	0.06
		Treatment	19	5	167	48	123	36	34	10	2	1	0	0	1.51	
	6	Control	39	11	140	40	127	37	36	10	4	1			1.50	-0.13
		Treatment	48	13	177	49	96	27	29	8	9	2	0	0	1.37	

SUPPLEMENTARY TABLE 3C Mean number of items reported by respondents for each list (n=702).

Sensitive Item	List	Control (± SE)	Treatment (± SE)	Prevalence Est
Pineapple	Practice	2.235	2.489	0.254 (± 0.09)
Collect wild meat to eat	1	2.246 (± 0.06)	2.290 (± 0.07)	0.045 (± 0.09)
	4	2.439 (± 0.06)	2.369 (± 0.07)	-0.070 (± 0.10)
	Mean	2.342	2.329	-0.013
Take wire snare to forest	2	1.704 (± 0.05)	1.680 (± 0.05)	0.024 (± 0.07)
	5	1.774 (± 0.05)	1.846 (± 0.06)	0.072 (± 0.08)
	Mean	1.739	1.763	0.024
Collect wildlife for livelihood	3	1.450 (± 0.04)	1.514 (± 0.04)	0.065 (± 0.06)
	6	1.497 (± 0.05)	1.374 (± 0.05)	-0.123 (± 0.07)
	Mean	1.473	1.444	-0.029

Supplementary Fig. 1. Prevalence estimates for sensitive items using UCT. Note // estimates show Standard Errors, rather than 95% Confidence Intervals shown in the main paper. SE reflects the statistical accuracy of the estimate, rather than the plausible upper and lower limits of the mean.

SUPPLEMENTARY TABLE 3b Respondents understanding of the UCT (n=702).

Statement	Agree	Neither	Disagree
I understood what I was supposed to do	462 (66%)	115 (16%)	125 (18%)
I felt able to answer the questions honestly	607 (86%)	69 (9%)	26 (3%)
I found the method confusing	79 (11%)	82 (12%)	541 (77%)
I believe the questioner cannot know which items apply	410 (58%)	113 (16%)	179 (25%)