Community Rangers Program Impact Evaluation: Final Report

Annexes

Laura Paler
Cyrus Samii
Matthew Lisiecki

Annex 1

Sampling strategy for villages

To test our hypotheses on village-level effects, we attempt to boost the power of our analysis by restricting ourselves to sampling from a relatively homogenous set of villages. In doing so, we circumscribe the subpopulation for which our causal effects are identified. We take this as a reasonable trade off for our study given the relatively small sample size. Because we assigned the program-level treatment to mukims, which are clusters of villages, the experimental design is a cluster-randomized experiment for village level effects. A standard way to analyze such a cluster-randomized study would be to either obtain data on all villages within the treatment or control mukim or to randomly sample villages from within the treated and control mukim. In our case, we did not have the resources to collect data on all villages, and so some kind of within-mukim sampling of villages was necessary. Our resources allowed us to sample on average four villages per mukim. A random sampling approach would introduce an element of sampling variability. Given a well-selected set of covariates, it is possible to remove this source of sampling variability while also minimizing the contribution to variance due to heterogeneity in outcomes by limiting oneself to a homogenous subset of villages. Doing so has consequences for external validity with respect to the overall population of villages in the study area, but we reasoned that it would be better to be better-powered to detect an effect for a well-defined subpopulation than to have poor power to detect an effect for the overall population of villages in the study area.

We used the following approach.[1] For all villages in the Ulu Masen mukims (both treated and control), we computed means (for continuous variables) or modes (for binary variables) of 31 village-level covariates that we presumed to be prognostic of our outcomes of interest (see Table 3). Then, within each mukim, we ranked villages in terms of the distance between their covariate vector and this vector of means and modes. We selected the four villages from each mukim with the smallest distance (in one case a mukim only had two villages, and so both were chosen; this provided us with two remainder mukims that we then spread to two randomly selected villages). The distance metric that we used was based on a propensity score regression of the village treatment indicators on the covariates. We computed the difference in the predicted propensities for a given village and predicted propensity when the village means and modes are used as the regressors in the propensity score model. The thinking behind using the propensity score regression was that it would produce a distance metric that placed special emphasis on covariates that were out of balance as a result of the realized treatment assignment. By construction this approach will tend to homogenize the resulting sample in a way the places utmost weight at the center of the covariate distribution. At the same time, the distance metric is dependent on the particular realized treatment assignment, and so over the array of possible treatment assignment, the effective probabilities of inclusion for different villages may vary (conditional on any treatment assignment these probabilities are zero or one, of course). This may introduce some bias (along the lines of the discussion in the previous paragraph) but the expectation is that the resulting reduction in variance would yield a highly favorable trade-off relative to study power. In principle, one could

[1] In constructing the homogenous subpopulation of villages we want to minimize the potential for bias from having the set of selected villages vary over the mukim-level treatment assignments. If this were permitted to vary widely, then the estimation of treatment effects would be confounded by the fact that some villages may never, under any treatment assignment, contribute certain potential outcomes. That is, if the homogenization procedure resulted in a substantial number of villages only ever being selected if they were in treated mukims (or vice versa), then there would be a substantial asymmetry in the set of treated potential outcomes relative to control potential outcomes sampled by the design.

evaluate this by working through the various mukim level treatment assignments and constructing the resulting village samples.

Annex 2

Descriptive statistics

Table 1, Table 2 and Table 3 provide descriptive statistics on the villages included in the study as well as the youth who were part of the ranger candidate recruitment pool and the non-experimental controls from the non-CRP mukim in the Ulu Masen area. The data used to create Table 1 come from the 2011 Village Potential Statistics (PODES) dataset collected by Indonesia's national statistics agency.[2] The data for Table 2 come from a baseline survey issued to ranger candidates. The data for Table 3 come from the endline survey of rangers, control group ranger candidates, and youth in non-CRP mukim. Table 1 and Table 2 show statistics for both treated and control areas, which allows us to assess balance in background conditions across villages and candidates assigned to the treatment and control conditions. Table 1 also shows characteristics for the non-experimental control group drawn from the Leuser system. Recall that this non-experimental control group was constructed via the matching strategy described in the previous section. For the ranger candidates, a non-experimental control group was constructed using the weighting strategy described in the previous section. Characteristics for this sample are shown in Table 3. These non-experimental control groups are used to evaluate spillover effects.

For the program villages, we see that agriculture predominates among household livelihoods, with rice cultivation being main crop. On average the villages contain around 130-150 households, with about half of the villages being multi-ethnic. The treatment, control, and Leuser communities are balanced on these variables. Many households host migrant workers, a factor that is important when evaluating occupational options for youth that might participate in the ranger program, given that most such work-related migration is among those in the youth age bracket that would be eligible for the program. This variable is somewhat out of balance across the treatment conditions, with about a quarter of households with migrant workers in the treated and Leuser villages, but nearly two-thirds in the control villages. The analysis below checks robustness of our results to controlling for this variable.

With respect to forest and environmental conditions, most villages live immediately near forestland, although the type of forestland differs a bit across the treatment conditions: similar proportions of treated and Leuser villages are located immediately next to conservation and production forests, whereas control villages tend more often to be located immediately next to production forest. This is another factor for which we will control in the analysis below. Burning to clear forests and flooding over the three years prior to the program were each fairly common, affecting around a third to a half of villages across treatment conditions. Between a quarter and one-third of villages live on sloped terrain, which is important, as deforestation is typically less common in sloped areas. The share with incline more that 15 degrees is slightly higher than that. The vast majority of villages are located beside rivers, with only a small minority share being seaside. Documented problems of water pollution were rare. Thus, the villages tend mostly to be located inland, along rivers, and on moderately hilly terrain. With respect to infrastructure, less than half are accessible via paved roads and a very small minority host markets, indicative of the

[2] The 2011 PODES data are available from the World Bank Micro-data inventory at http://microdata.worldbank.org/index.php/catalog/1826.

remoteness of many of these locations. The vast majority are serviced by health posts, indicative of degree of state penetration, but active formal organizations (such as unions or officially recognized cooperatives) are rather rare.

For the ranger candidates, we see that the mean age was 27 and the range was 18-49 (which is higher than the anticipated goal of capping 'youths' at 35 years of age). At the time of their application to CRP, 21 % were married or engaged and between a half and two-thirds had at least a high school education. The mean score of about 2.7-2.9 on the "not underemployed" index implies that about seventeen % reported that they were *not* underemployed, meaning that they were working full-time, were not seeking work, or were students. This is important as it indicates that attractive alternative occupational options were likely rare for ranger candidates. At the same time only around a fifth indicated that their parents were supporting them. In terms of conflict exposure, altogether 90% of all candidates had been affected by the conflict in some way, with 40-45% saying they had property damaged and 81% reporting displacement. Between 10 and 15% said that they had been members of a fighting group, while between 15% and 27% indicated that they had family members killed. Because of the imbalance across treatment and control groups, we will evaluate robustness to controlling for these variables in the analysis below (we will also control for other basic background characteristics, as indicated in the "include as controls" column).

Looking at Panel G we also see that 12% of candidate rangers admitted that they had cut or transported trees for illegal loggers, while around 20% said that they had been asked to do so. Just under half candidates reported that they supported the need of villagers to log in order to earn income. These variables indicate that illegal logging is present in these youths' lives, albeit not to such an extent as to engage more than a minority of them directly. Finally, candidates report some encounters with the police; about a third said that the police had harassed them while 14-12% report having been arrested. Reports of disputes, criminality, or fighting were rare. Table 3 shows that we were able to reweight the non-experimental controls so as make them comparable in terms of age, Acehnese identity, work situation, life satisfaction, various adverse experiences during war, and whether they hailed from a fighting group (we only had endline data from the non-CRP mukim youth, and these are the variables available in the endline survey that measured pre-program conditions).

Table 1. Characteristics of Ulu Masen control, Ulu Masen CRP treated, and Leuser matched control villages (2011 PODES data)

	Control Mean (N=54)	Treated Mean (N=56)	Leuser Matched Mean (N=56)	Control-Treated p-value (unadjusted)	Control-Leuser Matched p-value (unadjusted)
Socio-economic variables					
Inverse cov. weighted avg. of socio-economic variables	-0.19	-0.30	-0.33	0.60	0.54
Share of HH in agriculture	85.81	88.40	85.81	0.57	1.00
Any violent conflict in village in 2010-2011?	0.00	0.00	0.00	1.00	1.00
Village is predominantly estate/plantation agr.	0.06	0.06	0.13	0.99	0.43
Share of HH with migrant worker	0.27	0.66	0.28	0.11	0.96
Multiethnic village	0.45	0.45	0.45	0.97	1.00
Number of households	132.61	144.47	132.60	0.70	1.00
Share of villages that are not majority Acehnese	0.00	0.00	0.30	1.00	0.10
Village is predominantly rice cultivation	0.75	0.88	0.75	0.22	0.99
Forest and environment variables					
Forest/environment factor score	1.82	1.73	1.82	0.87	0.99
Water factor score	-0.21	0.26	-0.21	0.27	1.00
Any burning to clear farmland in 2010-2011?	0.45	0.36	0.47	0.61	0.89
Village is inside forest	0.10	0.08	0.15	0.70	0.63
Village is located immediately next to forestland	0.54	0.63	0.54	0.54	1.00
Village is located immediately next to conservation forest	0.36	0.18	0.36	0.19	1.00
Village is located immediately next to production forest	0.28	0.52	0.33	0.16	0.85
Opening up of new agricultural land in 2010-2011	0.09	0.05	0.09	0.58	1.00
Any flood between 2008-2011	0.39	0.26	0.44	0.32	0.73
Any forest first between 2008-2011	0.00	0.00	0.03	1.00	0.28
Village has irrigation	0.46	0.55	0.36	0.62	0.51
Village is located on a slope	0.34	0.27	0.22	0.65	0.53
Land incline more than 15 degrees	0.42	0.33	0.52	0.58	0.49
Quarry at the village	0.28	0.38	0.11	0.40	0.06
Village is beside a river	0.81	0.88	0.84	0.41	0.69
Village is beside the sea	0.16	0.10	0.03	0.55	0.14
Village had polluted water in 2010-2011	0.00	0.14	0.09	0.15	0.14
Infrastructure variables					
Inverse. cov.weighted avg. of infrastructure variables	0.07	-0.08	0.07	0.64	1.00
Village has asphalt roads	0.43	0.40	0.43	0.85	1.00
Village hosts active formal organizations	0.24	0.33	0.26	0.65	0.91
Village has a health post	0.94	0.90	0.88	0.65	0.22
Village has a market	0.11	0.08	0.17	0.69	0.73

Table 2. Characteristics of mukim control and ranger treated youth – youth baseline data

	Mean in Control	Mean in Treated	p-value test of diff	Include as control
PANEL A: BASIC INFORMATION				
Age	27.15	26.84	0.537	Y
Married or engaged	0.21	0.21	0.848	Y
At least a high school education	0.65	0.56	0.158	Y
Supported by parents	0.22	0.20	0.643	
Score on candidate ranger quiz	34.18	33.78	0.508	Y
PANEL B: ECONOMIC WELFARE				
Not underemployed (working full time, not seeking work, or student)	2.88	2.69	0.124	Y
Uses protected water source	0.94	0.84	0.006	Y/I
Floors made of high quality material	0.77	0.81	0.350	
Walls made of high quality material	0.70	0.76	0.190	
Cooks with gas/electricity	0.45	0.47	0.778	
Living comfortably or coping with present income	0.68	0.67	0.822	
Able to earn a decent living relative to others in the village	1.81	1.89	0.067	Y/I
Household perceived wealthy relative to others in the village	1.76	1.77	0.827	
Perceived future household economic condition is positive	2.18	2.27	0.152	
PANEL C: CONFLICT HISTORY				
Wounded because of the conflict	0.13	0.21	0.041	Y/I
Kidnapped, jailed, or tortured during the conflict	0.14	0.18	0.465	
House lost or destroyed during the conflict	0.17	0.21	0.340	
Valuable property stolen and/or confiscated during the conflict	0.40	0.45	0.267	
Displaced during the conflict	0.81	0.81	0.915	
Household members were killed and/or disappeared because of the conflict	0.15	0.27	0.026	Y/I
They are a former member of a fighting group	0.10	0.15	0.220	Y
PANEL D: ATTITUDES TOWARDS PEACE				
Agree that The Helsinki Accord has been a good thing for Aceh	0.97	0.94	0.222	
Agree that The Helsinki Accord has been a good thing for them	0.92	0.89	0.379	
Trust in the district government to work for people's best interest	0.84	0.81	0.452	
PANEL E: COMMUNITY PARTICIPATION				
Almost always or always contribute labor/money to gotong royong	3.27	3.14	0.082	Y/I
Always or often participate in farmers' and/or traders' group	1.31	1.23	0.260	
Always or often participate in credit/finance group	1.04	0.98	0.460	
Always or often participate in cultural/ethnic/religious group	1.71	1.59	0.027	Y/I
Always or often participate in KPA	0.63	0.59	0.588	
Always or often participate in another political group	0.33	0.39	0.323	
Always or often participate in a youth and/or sports group	1.85	1.76	0.075	Y/I
PANEL F: SELF ESTEEM				
Feel they get more respect from people living in the village than others their age	0.07	0.11	0.173	
Do not enjoy convincing others of their opinion	0.80	0.80	0.984	
Do not like to assume responsibility	0.88	0.85	0.423	
Do not feel they are usually successful in everything they do	0.80	0.78	0.667	
Do not often give others advice	0.92	0.91	0.572	
Do not often look for ways to resolve conflicts	0.94	0.92	0.462	
PANEL G: LOGGING				
They have been asked to cut and/or transport trees for illegal loggers	0.19	0.23	0.403	
They have cut and/or transported trees for illegal loggers	0.12	0.12	0.994	Y
Support people from this village logging to earn money	0.41	0.48	0.163	
Support people from outside this village logging to earn money	0.10	0.19	0.031	Y/I
PANEL H: ENCOUNTES WITH POLICE				
They have been harassed by the police	0.29	0.35	0.131	
They have been arrested by the police	0.14	0.12	0.678	
They have had disputes with people in the village	0.11	0.12	0.675	
They have been accused of committing a crime	0.04	0.07	0.201	
They have been involved in physical fighting	0.11	0.15	0.275	

Table 3. Results of entropy matching for control groups

	EXPERIMENTAL		AFTER MATCHING						BEFORE MATCHING					
	CONTROL		Control mukim			Leuser mukim			Control mukim			Leuser mukim		
	Mean	*Var*	*Mean*	*Var*	*Diff in means*	*Mean*	*Var*	*Diff in means*	*Mean*	*Var*	*Diff in means*	*Mean*	*Var*	*Diff in means*
Age	26.166	24.595	26.169	24.618	-0.001	26.166	24.595	0.000	27.402	28.340	-0.249	26.748	26.069	-0.117
Acehnese	0.992	0.008	0.991	0.008	0.000	0.991	0.009	0.006	0.988	0.012	0.038	0.667	0.223	3.520
Work situation (2 yrs ago)	4.887	4.713	4.888	4.712	0.000	4.887	4.713	0.000	5.436	3.762	-0.253	5.038	4.705	-0.069
Life satisfaction (2 yrs ago)	4.290	2.993	4.291	2.997	-0.001	4.290	2.994	0.000	4.798	4.125	-0.294	4.075	4.533	0.124
Wounded during conflict	0.232	0.179	0.231	0.179	0.000	0.231	0.179	0.000	0.158	0.133	0.174	0.183	0.150	0.114
Jailed during conflict	0.098	0.089	0.098	0.089	0.000	0.098	0.088	0.000	0.057	0.054	0.136	0.078	0.072	0.066
House lost during conflict	0.227	0.177	0.226	0.176	0.000	0.227	0.176	0.000	0.089	0.081	0.328	0.231	0.178	-0.011
Property damaged during conflict	0.341	0.226	0.341	0.226	0.000	0.341	0.225	0.000	0.202	0.162	0.291	0.196	0.158	0.305
Displaced during conflict	0.743	0.193	0.742	0.192	0.001	0.743	0.192	0.000	0.535	0.250	0.474	0.500	0.251	0.555
HH member killed during conflict	0.120	0.106	0.120	0.106	0.000	0.120	0.106	0.000	0.107	0.096	0.040	0.126	0.110	-0.018
Member of a fighting group	0.096	0.088	0.096	0.087	0.000	0.096	0.087	0.000	0.045	0.043	0.175	0.065	0.061	0.108

Annex 3

Table 4. Logistic regression coefficients for determinants of attrition – youth baseline data

	b	SE
PANEL A: BASIC INFORMATION		
In treatment group	-1.96***	(0.38)
Age	-0.05	(0.05)
Married or engaged	0.66	(0.46)
At least a high school education	-0.86**	(0.37)
Supported by parents	0.17	(0.45)
Score on candidate ranger quiz	0.03	(0.04)
PANEL B: ECONOMIC WELFARE		
Not underemployed (working full time, not seeking work, or student)	-0.10	(0.48)
Uses protected water source	-0.13	(0.51)
Floors made of high quality material	-0.64	(0.63)
Walls made of high quality material	0.41	(0.64)
Cooks with gas/electricity	0.14	(0.45)
Living comfortably or coping with present income	0.15	(0.40)
Able to earn a decent living relative to others in the village	-0.44	(0.44)
Household perceived wealthy relative to others in the village	0.31	(0.51)
Perceived future household economic condition is positive	0.00	(0.37)
PANEL C: CONFLICT HISTORY		
Wounded because of the conflict	-0.23	(0.59)
Kidnapped, jailed, or tortured during the conflict	-0.01	(0.63)
House lost or destroyed during the conflict	0.39	(0.54)
Valuable property stolen and/or confiscated during the conflict	0.41	(0.38)
Displaced during the conflict	0.06	(0.65)
Household members were killed and/or disappeared because of the conflict	0.53	(0.48)
They are a former member of a fighting group	-0.92	(0.58)
PANEL D: ATTITUDES TOWARDS PEACE		
Agree that The Helsinki Accord has been a good thing for Aceh	-0.64	(1.12)
Agree that The Helsinki Accord has been a good thing for them	1.57	(1.08)
Trust in the district government to work for people's best interest	1.47**	(0.71)
PANEL E: COMMUNITY PARTICIPATION		
Almost always or always contribute labor/money to gotong royong	-0.21	(0.55)
Always or often participate in farmers' and/or traders' group	-0.16	(0.28)
Always or often participate in credit/finance group	-0.65**	(0.33)
Always or often participate in cultural/ethnic/religious group	0.49	(0.45)
Always or often participate in KPA	-0.45	(0.29)
Always or often participate in another political group	0.54	(0.35)
Always or often participate in a youth and/or sports group	-0.51	(0.40)
Feel they get more respect from people living in the village than others their age	-0.34	(0.54)
PANEL F: SELF ESTEEM		
Do not enjoy convincing others of their opinion	0.91	(0.65)
Do not like to assume responsibility	0.11	(0.60)
Do not feel they are usually successful in everything they do	-0.39	(0.58)
Do not often give others advice	-0.46	(0.66)
Do not often look for ways to resolve conflicts	0.06	(0.69)
PANEL G: LOGGING		
They have been asked to cut and/or transport trees for illegal loggers	1.17**	(0.59)
They have cut and/or transported trees for illegal loggers	-0.90	(0.81)
Support people from this village logging to earn money	-0.24	(0.46)
Support people from outside this village logging to earn money	0.58	(0.60)
PANEL H: ENCOUNTES WITH POLICE		
They have been harassed by the police	0.10	(0.47)
They have been arrested by the police	0.41	(0.76)
They have had disputes with people in the village	-0.50	(0.59)
They have been accused of committing a crime	-0.56	(0.88)
They have been involved in physical fighting	0.55	(0.54)
Constant	-2.00	(2.44)
N	448	

p<0.10* p<0.05** p<0.01***

Annex 4

Implementation

This annex presents data on the implementation of the CRP. We use these data to assess whether people in non-CRP localities had exposure to the program, which in turn allows us to assess whether there were channels through which spillover effects might occur. Then we examine attitudes toward the program within treated localities and among youth selected to become rangers.

Reported exposure to the CRP

To investigate exposure to the CRP and whether spillover occurred between the rangers group and our two control groups (non-CRP mukim in Ulu Masen and then in Leuser), we use data from the village head, household head, and youth surveys. We find that spillover was quite limited, only occurring substantially in terms of the awareness among a minority of village elites in control villages in the Ulu Masen area as well as awareness of the program among control youth in the CRP villages.

Village

Figure 1 to Figure 4 present the village heads' responses when asked a series of questions related to program exposure. Responses are broken down into three groups: villages in the Ulu Masen region that were CRP villages, villages in Ulu Masen that were not CRP villages, and villages in the Leuser region (where no villages took part in the CRP). When asked whether they had heard of the CRP (Figure 1), none of the Leuser village heads had heard of it at all as expected, while about a quarter of non-CRP Ulu Masen village heads had heard of it a little. Surprisingly, a few village heads in the CRP villages had not heard of the program. When asked if they had seen CRP rangers on patrol near their village (Figure 2), no village head in Leuser saw rangers on patrol (as would be expected), but approximately 20% of non-CRP Ulu Masen village heads had. This suggests that there was some limited program spillover in the Ulu Masen region. Figure 3 and Figure 4 show village head responses when asked if they had seen forestry ministry patrols or any other conservation programs, respectively. These questions allow us to assess whether CRP patrols may have displaced other types of activities, which would be another form of spillover. There is no evidence of such displacement. Most village heads had seen ministry patrols, and that number was largely unaffected by CRP status or the Ulu Masen/Leuser distinction. As for other conservation programs, the majority village heads in all 3 categories said they had not seen patrols operating near their villages, with very similar patters across all three types of villages.

Figure 1. Familiarity with CRP - Village heads

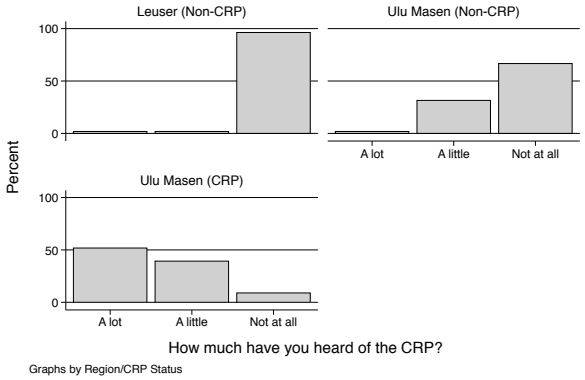


Figure 2. CRP patrols observed - Village heads

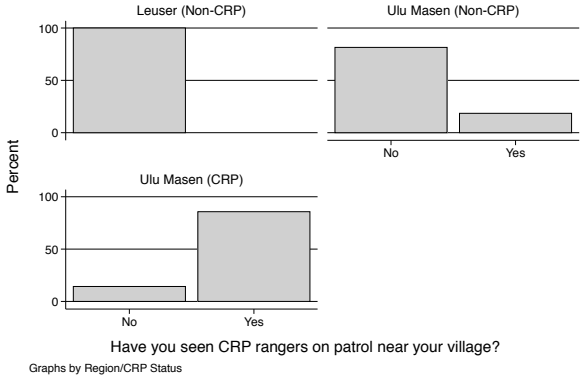


Figure 3. Forestry Ministry patrols observed - Village heads

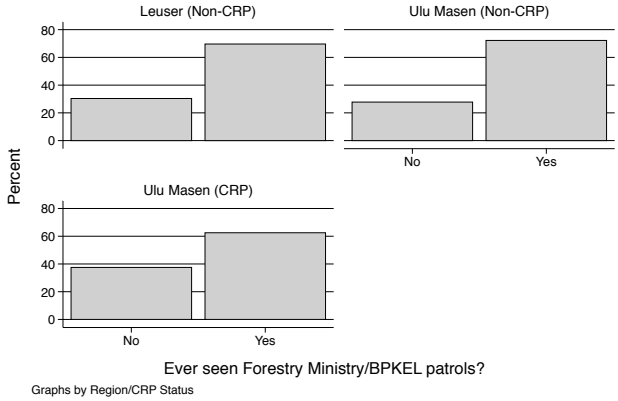
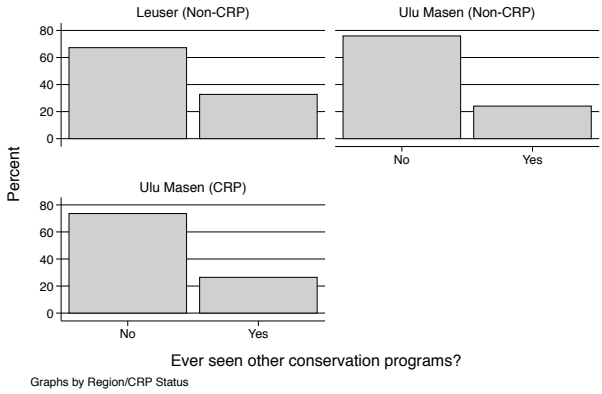


Figure 4. Other conservation programs observed - Village heads



Household

Figure 5 to Figure 8 present the results for these four questions on CRP exposure from the household head survey. Again, responses for each question are broken down between those from households in CRP mukim (all of which were in Ulu Masen), those from non-CRP mukim in Ulu Masen, and those from Leuser. Figure 5 shows that household heads in CRP villages were far more likely to have heard of the CRP, and that household heads in non-CRP villages were only slightly more likely to have heard of the CRP than their counterparts in Leuser. The program spillover indicated in the village head version of the same question, if it did exist, seems to have been limited to the village elite, rather than the average household. Figure 6 shows responses when asked whether they had actually seen CRP patrols. Neither Leuser nor non-CRP Ulu Masen household heads were likely to have seen patrols, but the majority of household heads in CRP villages witnessed patrols near their villages. When asked about seeing patrols from the Forestry Ministry or seeing other conservation programs, the responses were similar for both Leuser, CRP, and non-CRP Ulu Masen villages (Figure 7 and Figure 8). A majority in all three categories had seen ministry patrols, and over 75% of household heads had not seen other conservation programs. There are no significant differences across categories of households. Thus, there is no evidence of substantial spillover at the household level.

Figure 5. Familiarity with CRP - HH heads

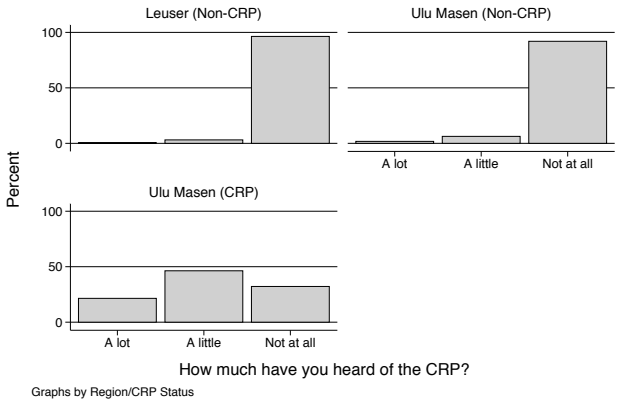


Figure 6. CRP patrols observed - HH heads

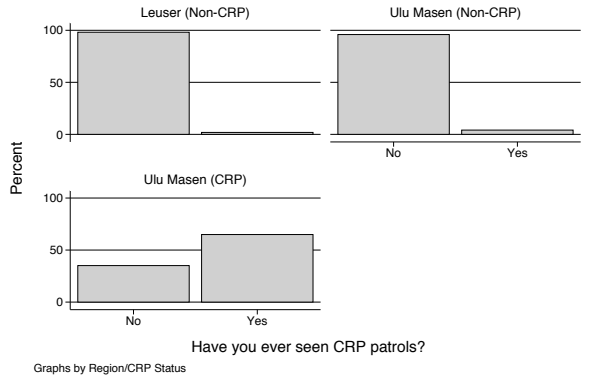


Figure 7. Forestry Ministry patrols observed - HH heads

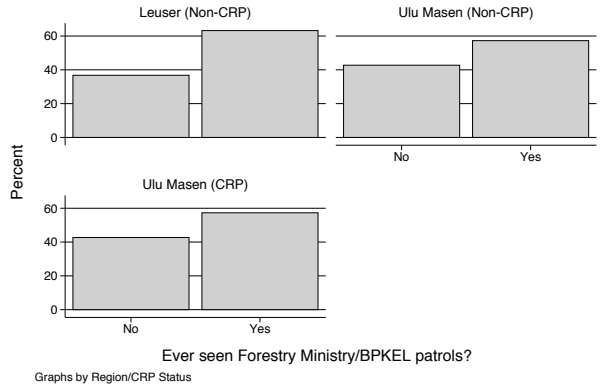
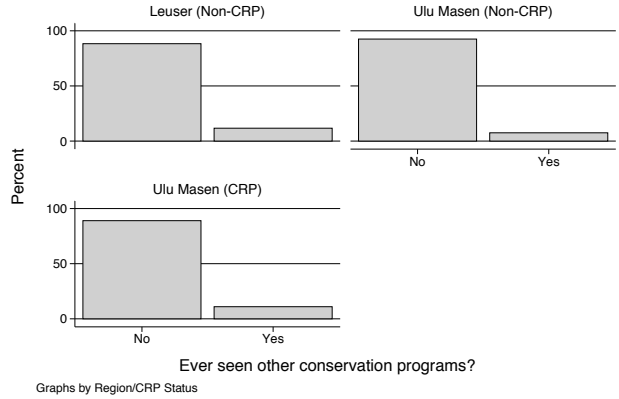


Figure 8. Other conservation programs observed - HH heads



Youth

We can see in Figure 9 that there was variation across the three control groups in exposure to the CRP program, where more than 50% of control youths in ranger mukim were aware of the rangers, while the vast majority of youths in control or Leuser mukim had not heard of them at all. Similarly, Figure 10 shows that almost all control rangers had seen the treatment rangers at work, whereas

almost none of the youth had been exposed to rangers in the control or Leuser mukim. Beyond witnessing CRP activities, there may be spillover from the ranger group to the control group through livelihood benefits. We can see from Figure 11, however, that only 11% of the control group was indeed invited to join in these projects, in which case it is safe to assume that livelihood benefits of the program were indeed highly concentrated among the Rangers themselves.

Figure 9. How much have you heard about CRP - Youth

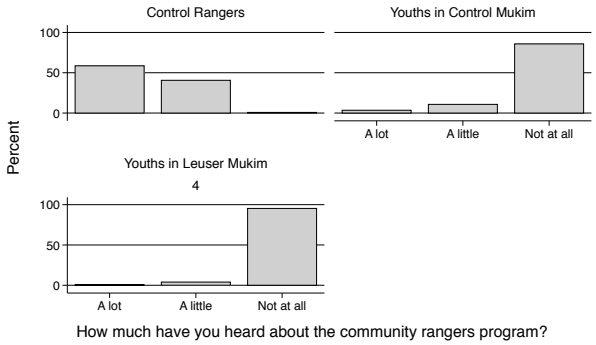


Figure 10. Seen rangers working in or near the village - Youth

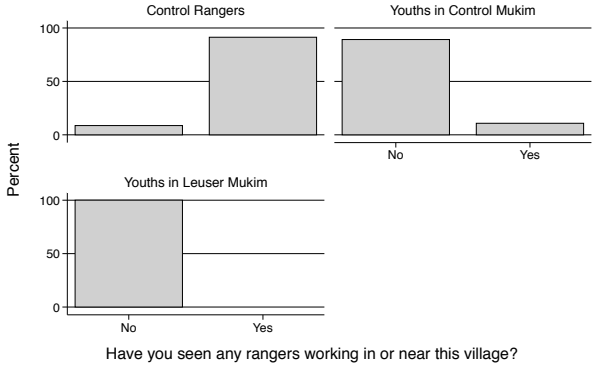
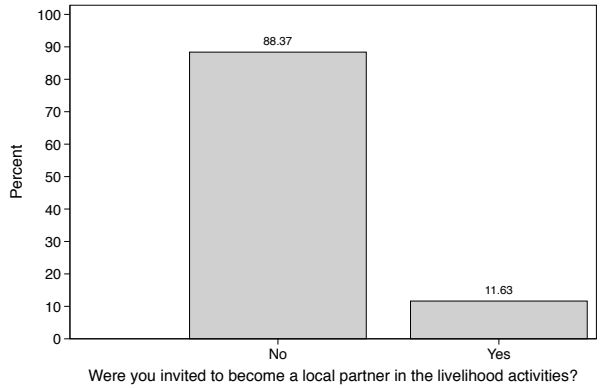


Figure 11. Control group participation in livelihood benefits - control group in CRP mukim



Experience with the CRP program

We first examine behaviors and perceptions of rangers and ranger candidate youth as they pertain to program implementation. Then we turn to the perceptions of village and household heads.

Rangers

Table 5 provides a "manipulation check" with respect to the experience of being a ranger. It studies how being selected as a ranger affected the likelihood of engaging in activities that were supposed to be central to the CRP, such as meetings with village and mukim heads and participation in various community projects. The mean in the control group presents the proportion of control rangers that ever took part in those activities in which the rangers engaged in. Broadly speaking, this provides a sense of how ranger activities differed from the normal activities of youth. We observe that, for each activity, being a ranger had a significant positive effect on whether a youth participated in an activity. We also see, however, that some activities had high rates of participation even in the control group. For instance, 84% of the control group said that it had participated in meetings will village and mukim leaders; 79% had worked on livelihood projects of some sort; 66% had helped to resolve a conflict; and 71% had helped to clean up the village. We see that the ranger program had the biggest effect on increasing the %age of youth who engaged in community outreach (49 %age point increase), assisting with natural disasters (62 %age points); and participating in Quran readings (52 %age points). These results help us to interpret "what it meant" to be a ranger rather than a non-ranger youth.

Figure 12 and Figure 13 provide details on the conservation-promotion and livelihood activities that rangers undertook. From Figure 12 we see that their conservation-promotion activities tended mostly to consist of meeting with mukim and village leaders, forest patrols, community outreach, village clean-ups, and Quranic readings. Helping to handle wild animal crop attacks, natural disasters, and local conflicts were more rare, owing to the contingent nature of such activities. Aside from these conservation-promotion activities, the rangers had a program of establishing sustainable livelihood demonstration projects in their home mukims. These were intended to serve both as a source of revenue for the rangers and also to provide instruction to host communities on methods of sustainable agriculture. Figure 13 shows that these activities were fairly evenly spread across livelihood activities that involved land preparation, food garden preparation, the purchase and care for new livestock, nursery construction, seedling purchase and development, and veterinary care.

Table 5. Effect of being a ranger on activities related to the program (manipulation check)

			Model 1 (no controls)			Model 2 (controls)		
		Mean in controls	*Treatment Effect*	*s.e.*	*p-value*	*Treatment Effect*	*s.e.*	*p-value*
(1)	Meetings with village/mukim leaders	0.84	0.13***	(0.04)	0.005	0.14***	(0.04)	0.002
(2)	Community outreach	0.45	0.49***	(0.06)	0.000	0.49***	(0.05)	0.000
(3)	Livelihood project	0.79	0.21***	(0.03)	0.000	0.22***	(0.04)	0.000
(4)	Veterinary care	0.45	0.30***	(0.04)	0.000	0.27***	(0.04)	0.000
(5)	Assisting with natural disasters	0.18	0.62***	(0.04)	0.000	0.64***	(0.04)	0.000
(6)	Helping resolve conflict	0.66	0.30***	(0.04)	0.000	0.29***	(0.04)	0.000
(7)	Cleaning up villages	0.71	0.22***	(0.05)	0.000	0.22***	(0.05)	0.000
(8)	Quran readings	0.17	0.52***	(0.04)	0.000	0.54***	(0.05)	0.000

* p<.10, ** p<.05, *** p<.01

Figure 12. Ranger programmatic activities

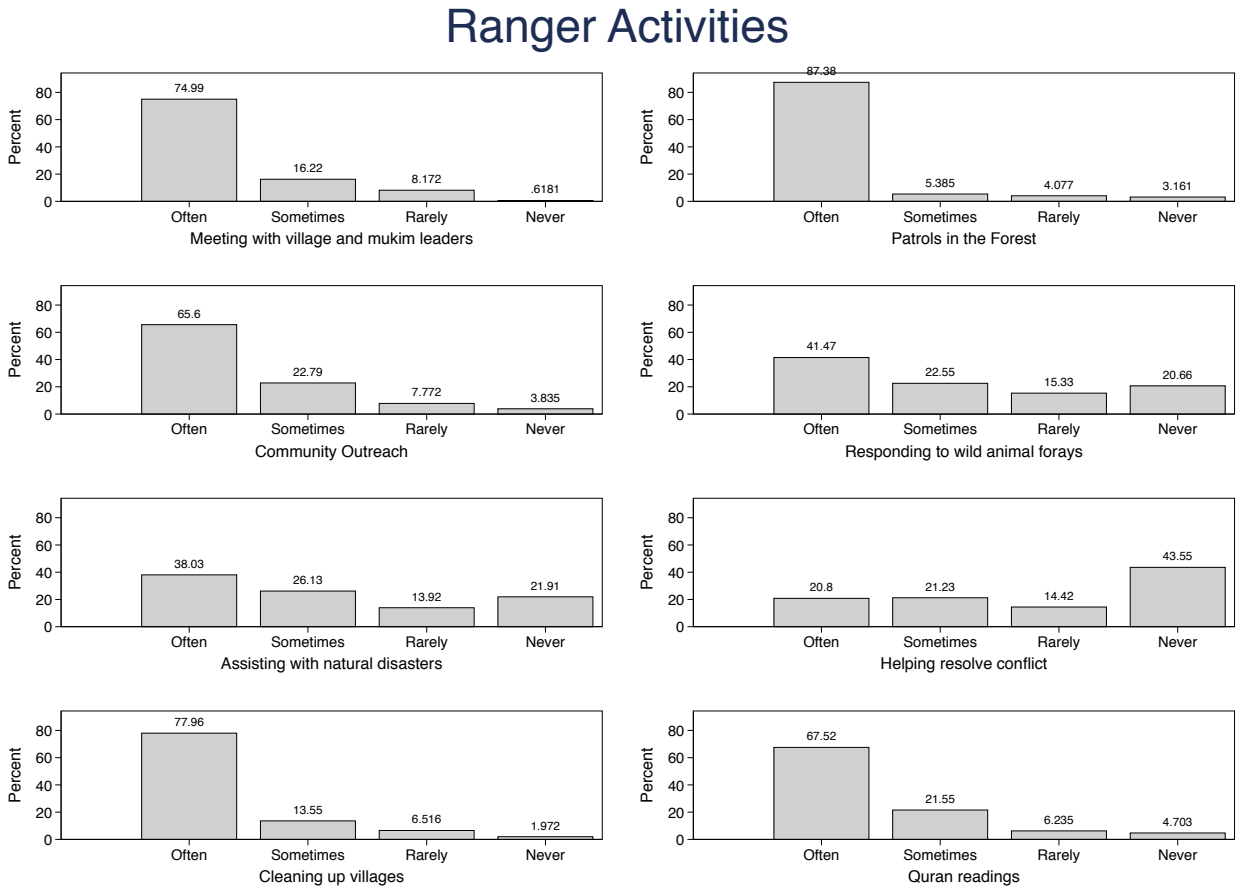


Figure 13. Types of livelihood activities undertaken by rangers

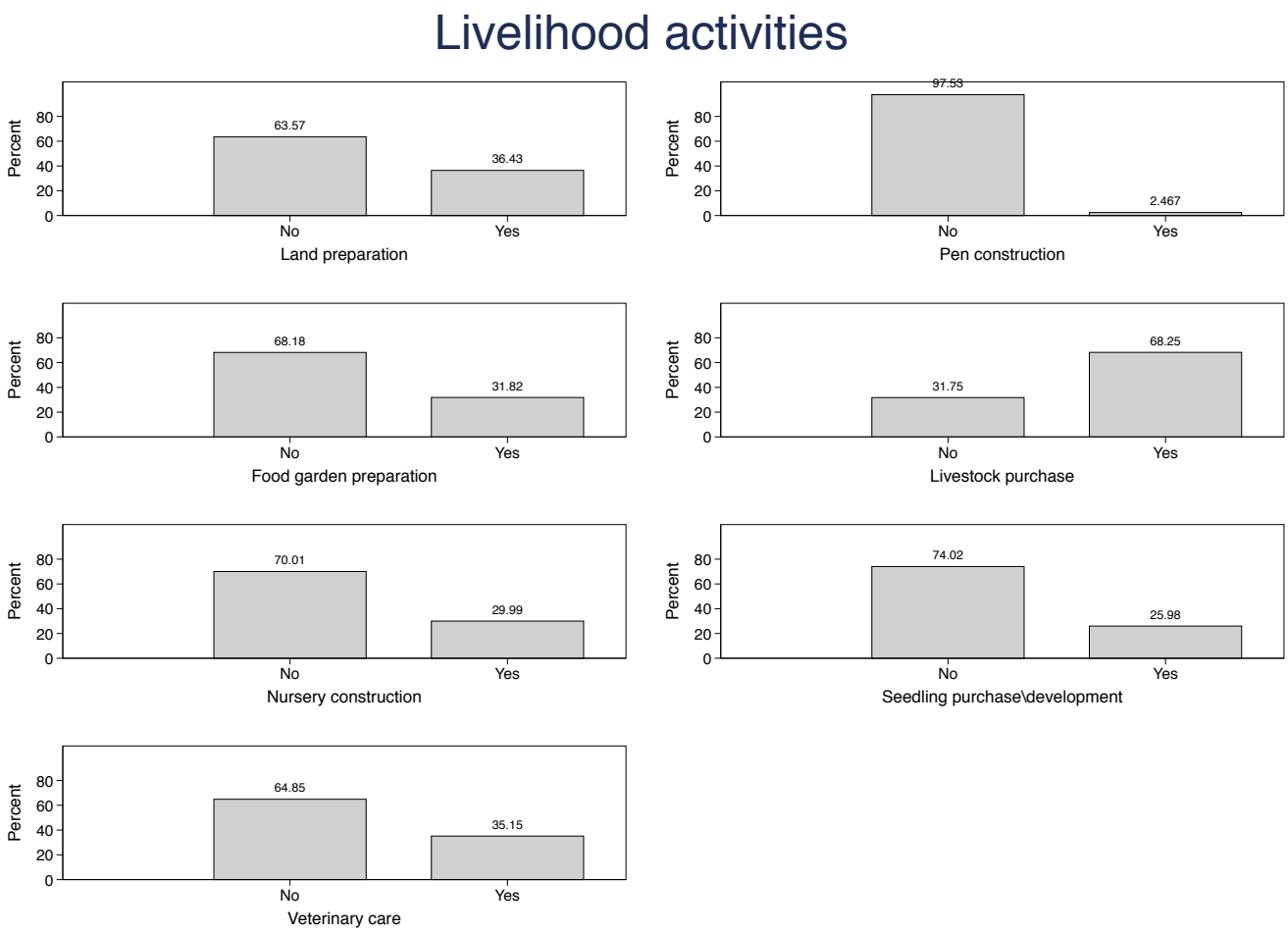
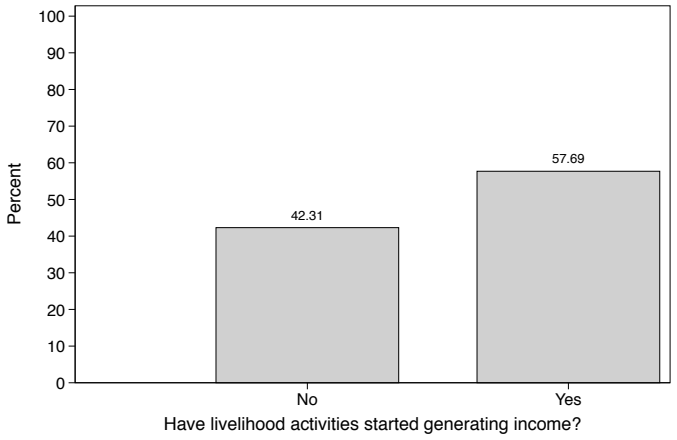
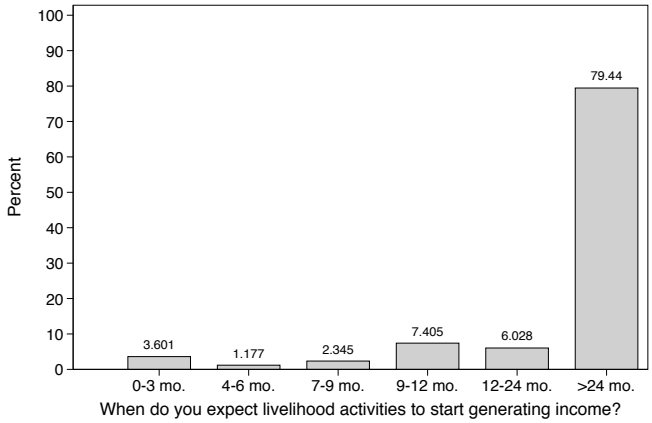


Figure 14 to Figure 16 allow us to understand how rangers understood the material benefits offered by the livelihood program. From Figure 14, we see that a majority (58%) of rangers indicated that their livelihood programs had started to generate some income. For those who reported that the activities had not yet started generating income, nearly 79% expected that it would take at least another two years to start receiving income from the project. The lower panels report the amount of actual income from the project at present and expected incomes two and five years in the future. Here we see that in fact few rangers had received any cash income by the time of the endline assessment. Most expected that they would receive some income over the coming year, but then only a minority indicated that they expected such income flows to extend into the second post-program year. This is indicative of the possibility that most rangers saw the livelihood program as something that might deliver a one-time benefit (e.g., from the rearing and then sale of livestock) rather than something that would provide a long-term source of income. Figure 15 shows that rangers expressed an intention to divide income from the livelihood equally among them, but that they tended not to view such income as meant to be shared with the broader community. Such intentions were put down in writing. This is consistent with the idea that the rangers took the livelihood programs to be primarily a method of compensation owed to them in return for their service to the CRP. In Figure 16, we see that rangers tended to express that decisions on livelihood activities and income-sharing were carried out in a harmonious manner and that the vast majority were at least "somewhat satisfied" by the livelihood program.





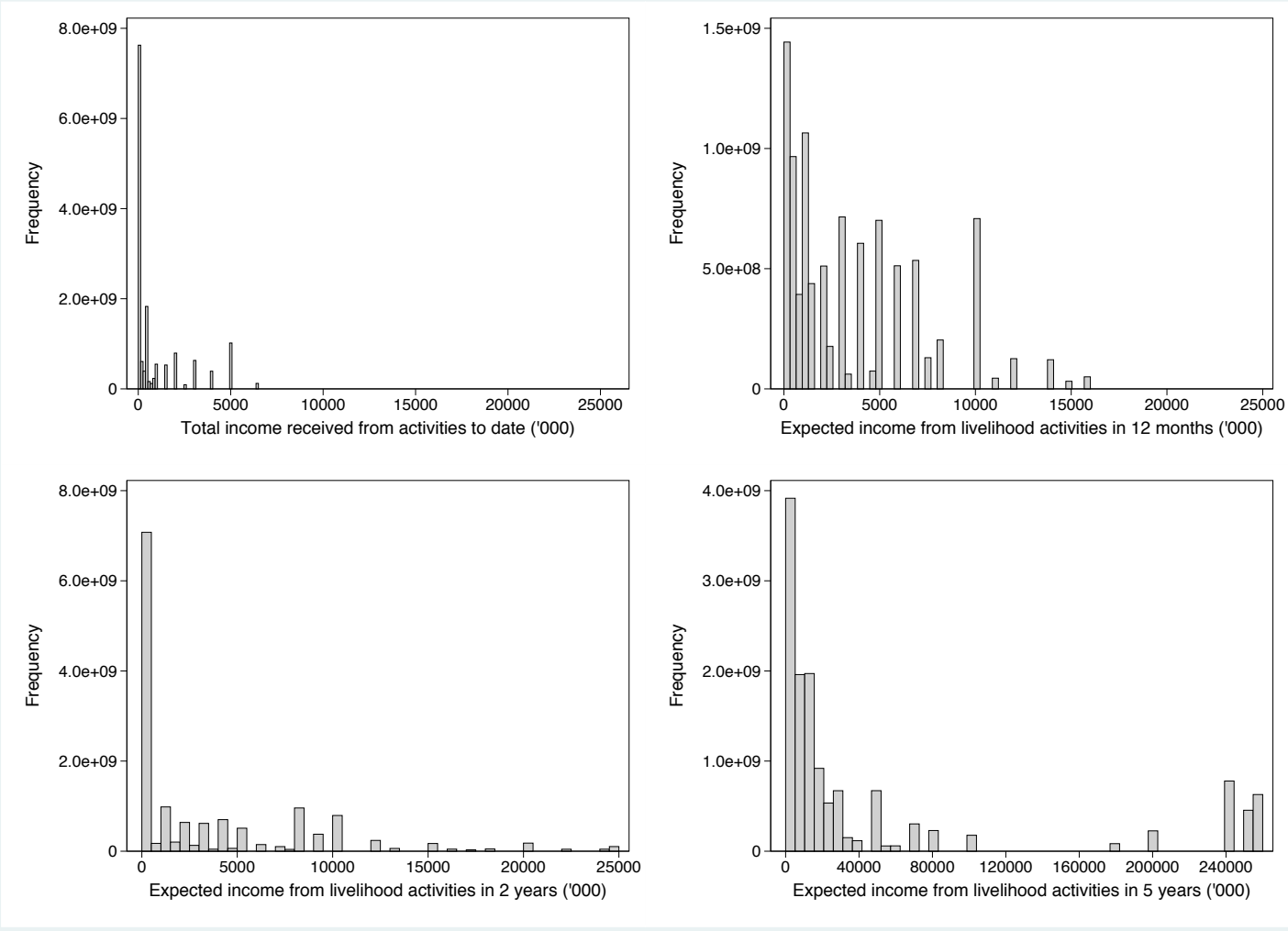


Figure 14. Income from livelihood activities

Figure 15. Income sharing

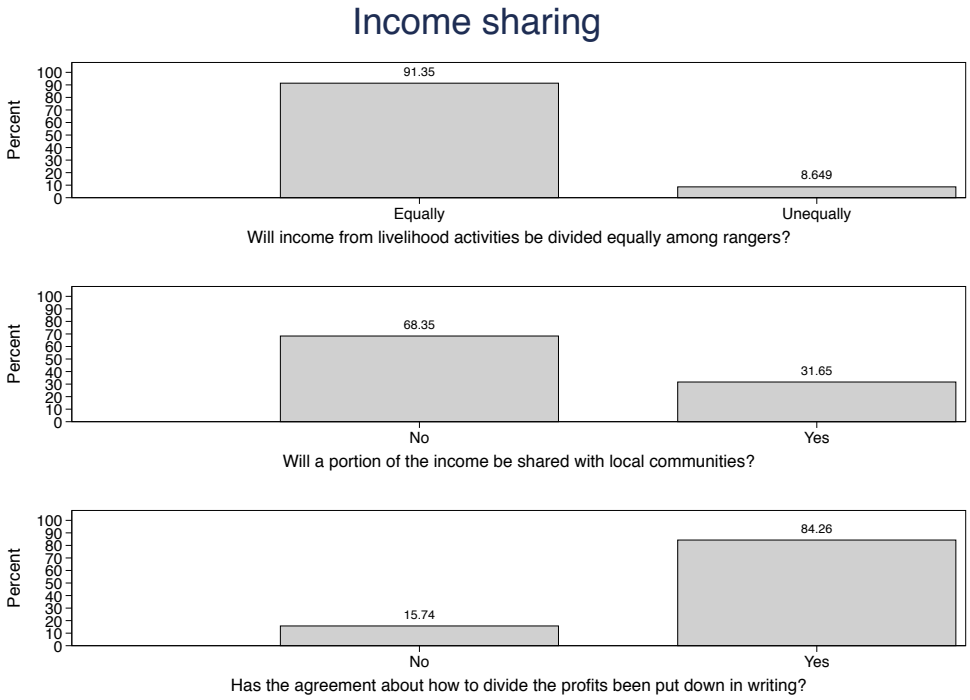


Figure 16. Attitudes toward livelihood projects

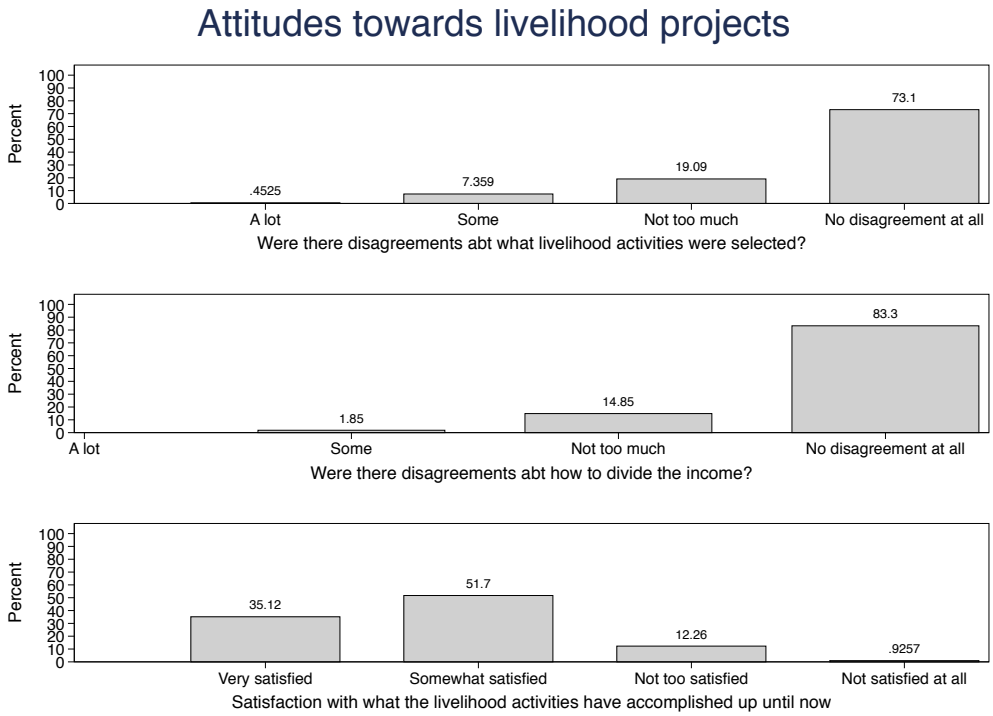


Figure 17 to Figure 21 show results for questions that asked about overall impressions of the experience of being a ranger. From Figure 17 we find that rangers reported generally high morale: a majority of rangers indicated that leaders were interested in what they thought, that disagreements on tasks among rangers were rare, that they felt proud of their team, and that their team was effective. From Figure 18, we see that the ranger youth tended to see the new skills (37%) or income (30%) as the most important benefits coming from their participation in the program. Among costs of being a ranger, Figure 19 shows tensions with loggers and poachers was the most important for the greatest share of those who responded (31% overall, or 48% of those who responded), although the modal response in this case was to say that there were no costs (37%, indicated as "No data" in Figure 19). This finding is interesting insofar as it suggests that the program was indeed targeting youth who expected to interact with illegal logging and poaching networks. Figure 20 shows that overall, 95% of rangers indicated that they would take the opportunity to continue ranger work if such an opportunity were offered. This is an overwhelming endorsement of the value of the program for this group of direct beneficiaries. Figure 21shows that village heads tended to agree with this positive assessment of the benefit of the CRP for those selected as rangers.

Figure 17. Morale and attitudes toward being a ranger

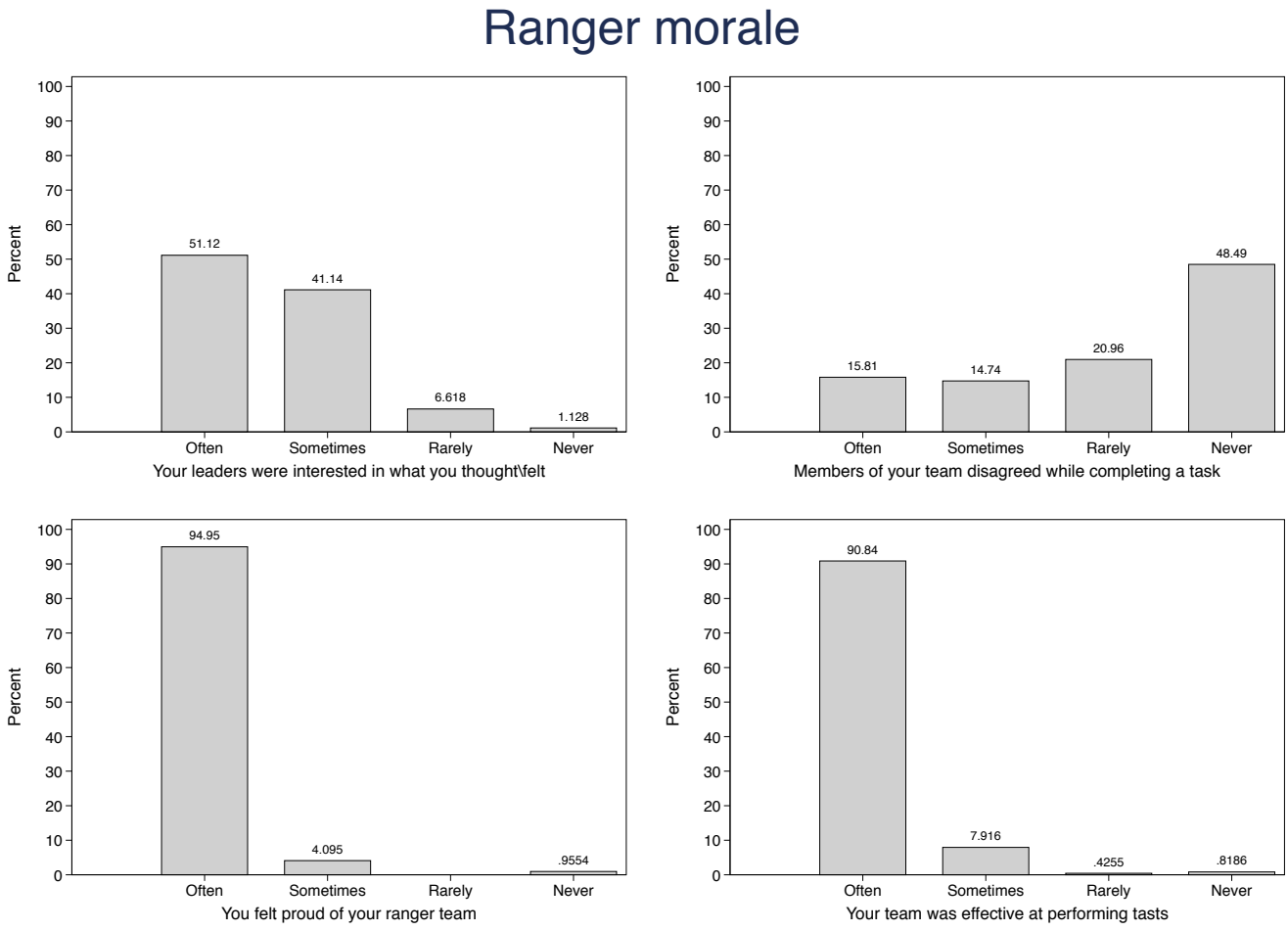


Figure 18. Perceived most important benefits of being a ranger

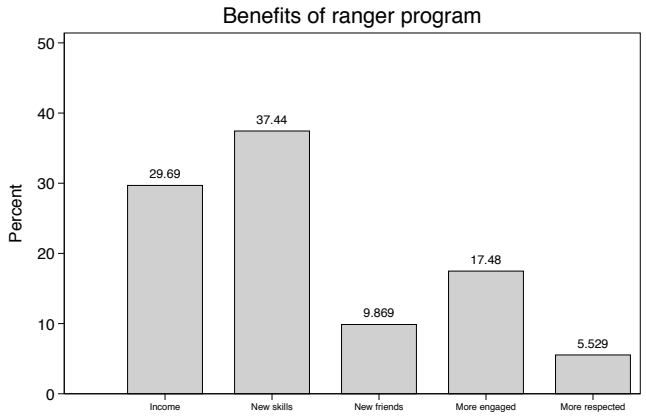


Figure 19. Perceived most important costs of being a ranger

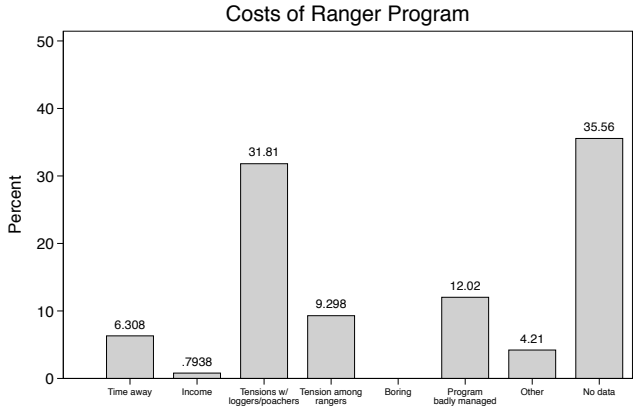


Figure 20. Overall impression of being a ranger

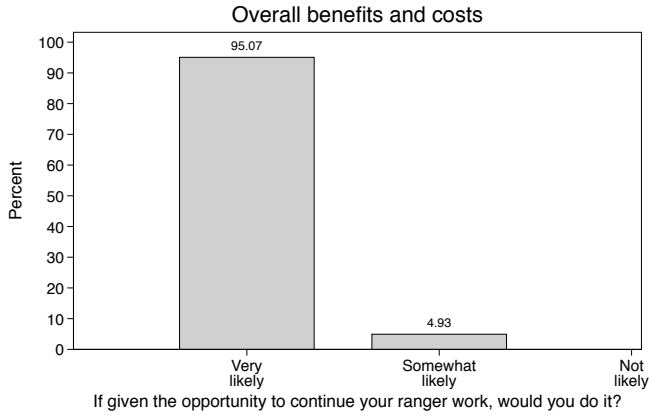
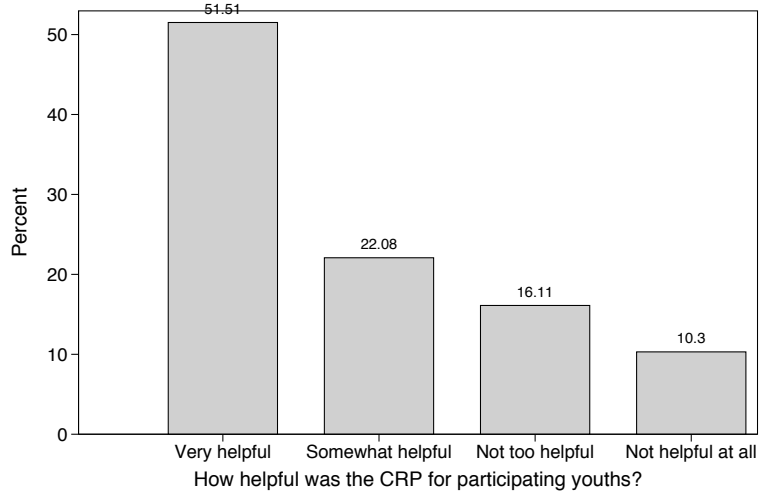


Figure 21. Benefit of CRP for participating youth - Village head survey



Village and household heads

Figure 22 to Figure 26 show the perceptions about the CRP from village heads and household heads interviewed in the household survey. Figure 22 and Figure 23 show that village heads tended to see rangers as primarily engaged in patrolling activities, which is consistent with what rangers reported themselves. Meetings with leaders, community outreach, assistance with natural disasters and wild animal forays, and clean up activities were also commonly witnessed. Efforts to resolve conflicts were not commonly witnessed, and household heads also head little exposure to rangers livelihood activities.

Figure 23 also shows that households tended to have minimal exposure to the livelihood projects. The minimal exposure to the livelihood projects is most likely due to the fact they tended to be located at a single location in the mukim, whereas this survey samples from households in villages throughout the mukim. We infer that there were not extensive efforts to bring people from across the mukims to witness the livelihood projects. This is in line with what we saw above in the rangers perceptions that the livelihood projects were meant primarily to be a form of private compensation for themselves. Figure 24 and Figure 25 further develop this point, indicating that in the vast majority of villages, none of the households participated in the CRP livelihood projects; overall less than 2% of sampled households indicated that they participated. Importantly, this suggests that the CRP was trying to affect attitudinal and behavioral change on the part of community members not by offering positive financial inducements but rather by relying on socialization and norms alone.

Despite the limited involvement of the community in the livelihood benefits, Figure 26 shows that in the village heads' estimation, benefits from the livelihood projects were not limited only to the rangers, although it is not entirely clear how to interpret this given the limited benefit and exposure of non-ranger households. One possible explanation is that the survey data is under-estimating the extent to which villagers benefitted from the livelihood projects. Activities associated with the livelihood projects—such as vaccinating animals and conducting livelihood training—reached members of the community beyond those who were included in running the projects or receiving income from there. According to FFI program documentation, livestock and agro-forestry trainings were held that involved nearly 700 community members. Similarly, over 3,700 livestock belonging

to 1,000 community members were vaccinated. Figure 22 and Figure 23 reflect village and household awareness that rangers were engaged in such activities. For instance, nearly sixty % of all heads of household reported awareness both that rangers were engaging in veterinary activities and engaging in community outreach. The survey, however, did not quantify these types of benefits that community members might have received.

Figure 22. What activities did you see rangers undertaking? - Village head survey

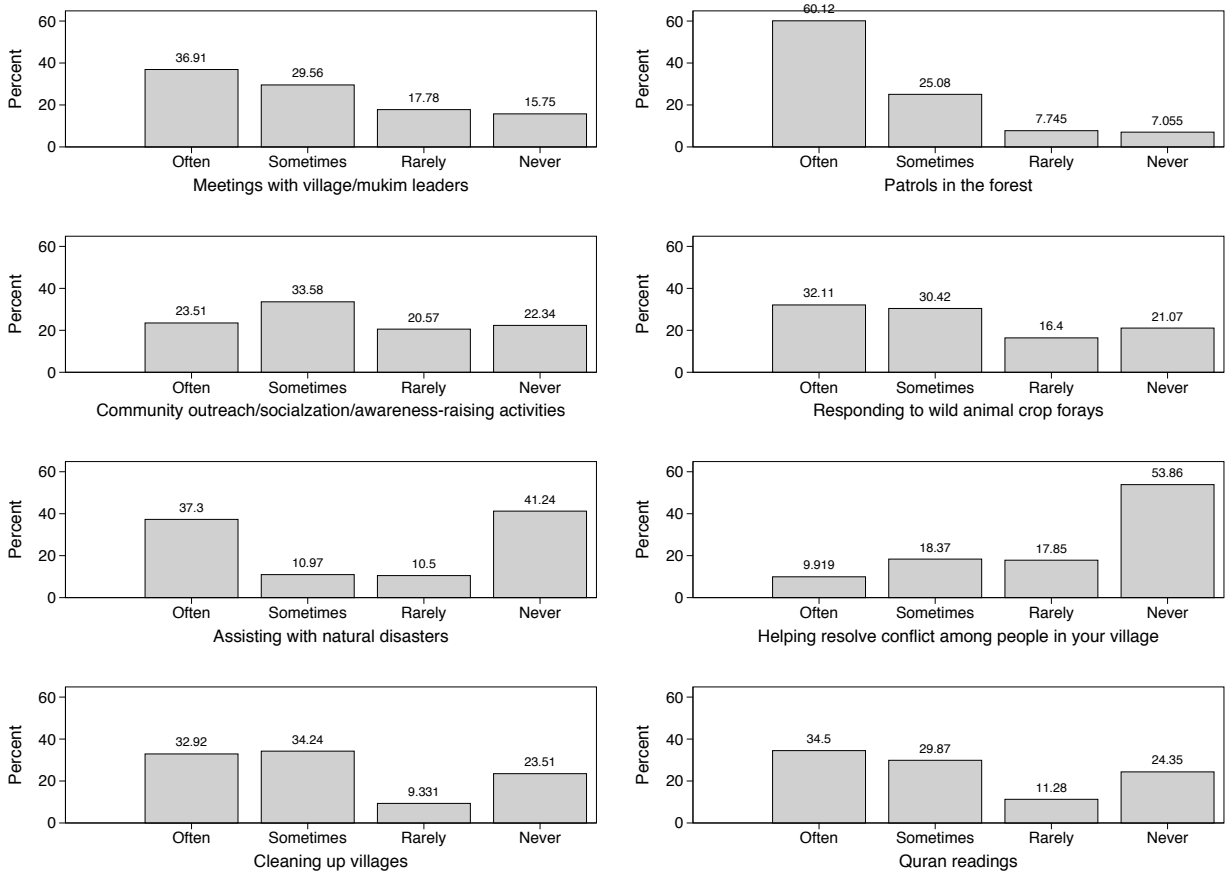


Figure 23. What activities did you see rangers undertaking? - Household survey

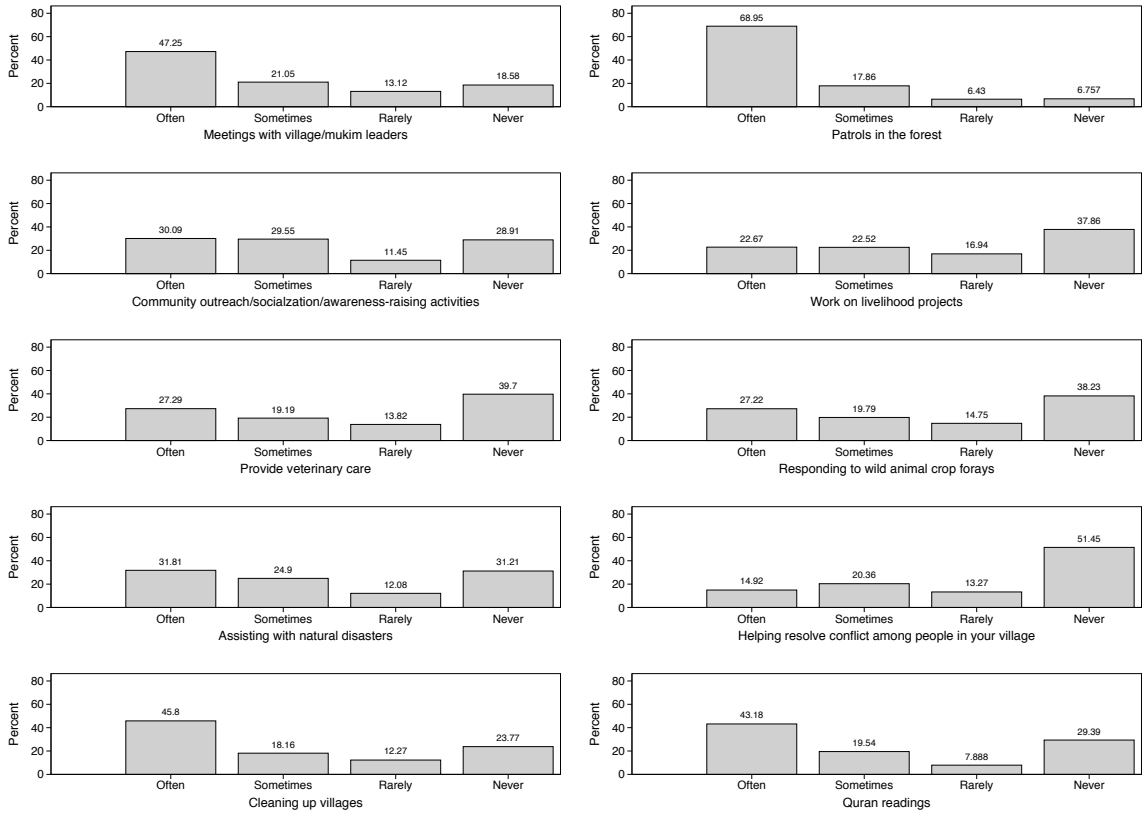


Figure 24. Number of households per village that participated in the livelihoods activities – Village head survey

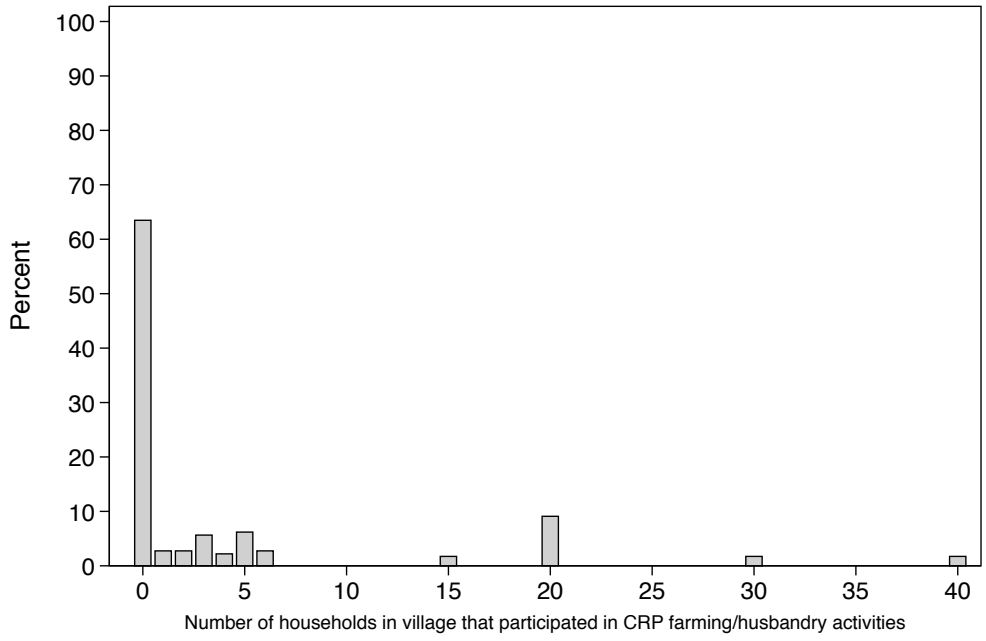


Figure 25. Were you invited to be a partner in a livelihood activity? - Household survey

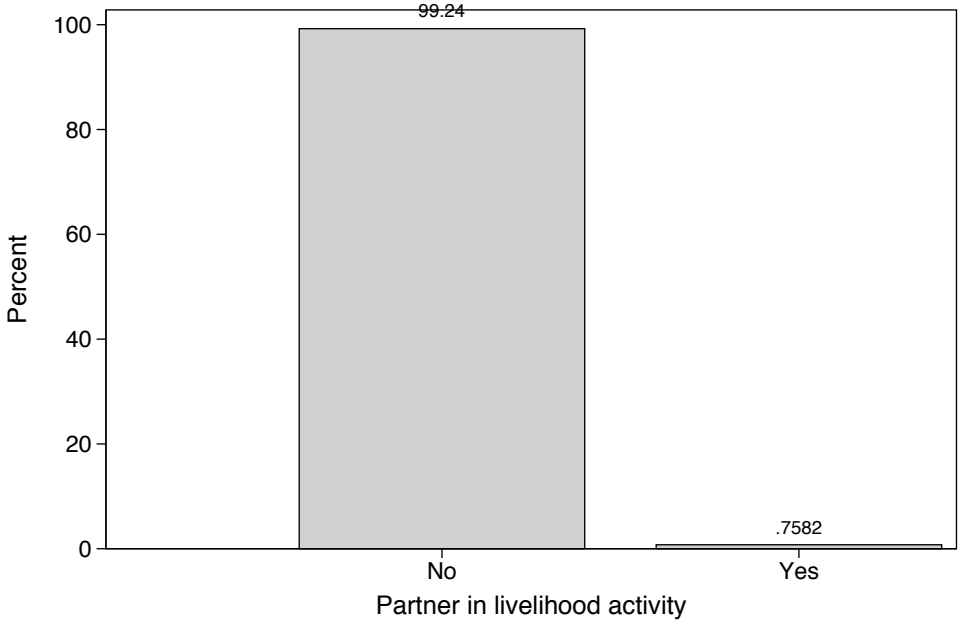
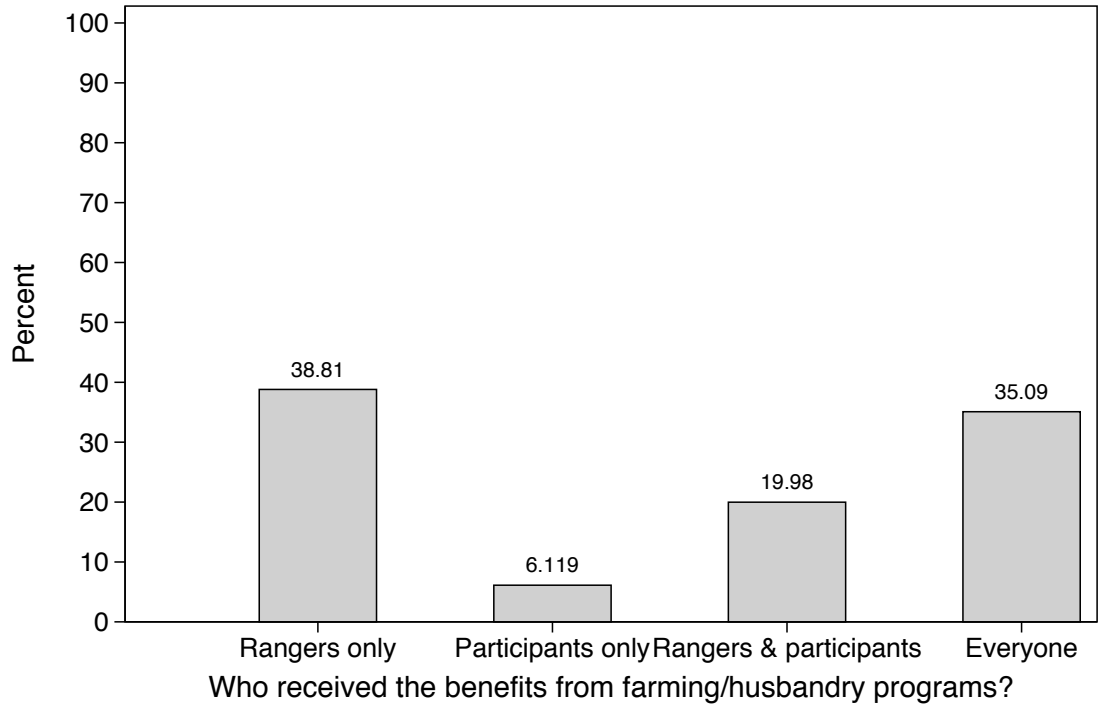


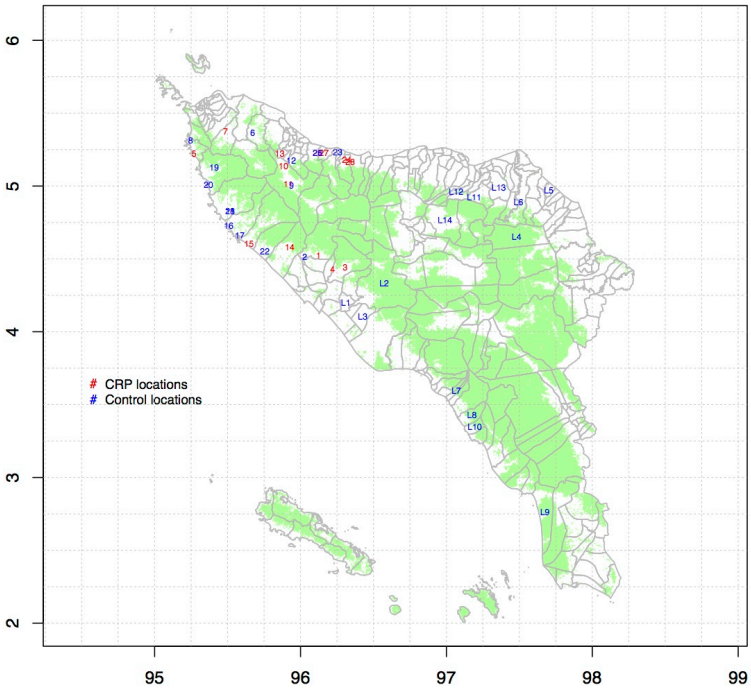
Figure 26. Who benefited from the livelihood activities? - Village head survey



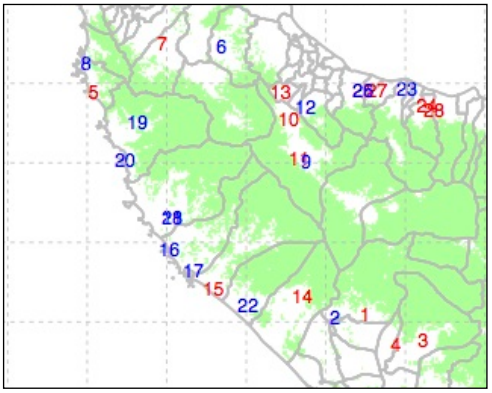
Geographic Coverage and Forest Patrols

The geographic coverage of the CRP was limited to zones that surrounded the Ulu Masen forest system Figure 27 displays the CRP program mukim centers as well as the control areas in Ulu Masen and Leuser. Forest patrols are a potential channel through which the CRP's geographic coverage would have spread beyond the CRP base mukim. Patrols were a core activity for rangers who spend between 1-4 weeks per quarter patrolling the forestlands in the Ulu Masen system. Patrols were conducted on foot by ranger teams from each of the program mukim, and they followed routes that originated in these home mukim. During patrols, rangers collected geocoded data on illegal forest activities, including animal traps and logging incidents. Figure 28 displays quarterly patrol coverage as it was entered into the program's geographic information system. The maps show cumulative coverage over the course of the program. We see that in fact, coverage was very local to the CRP base mukim, in which is consistent with the results that we saw above how reported levels of exposure to CRP patrols was negligible in village outside the CRP base mukim.

Figure 27. CRP mukim centers (red), control mukim centers in Ulu Masen (blue), control Kecematan in Leuser (blue, with codes "L#"), forest area at baseline (green). Kecamatan borders are drawn in gray. Decimal degree grid overlay (1 decimal degree=110km).

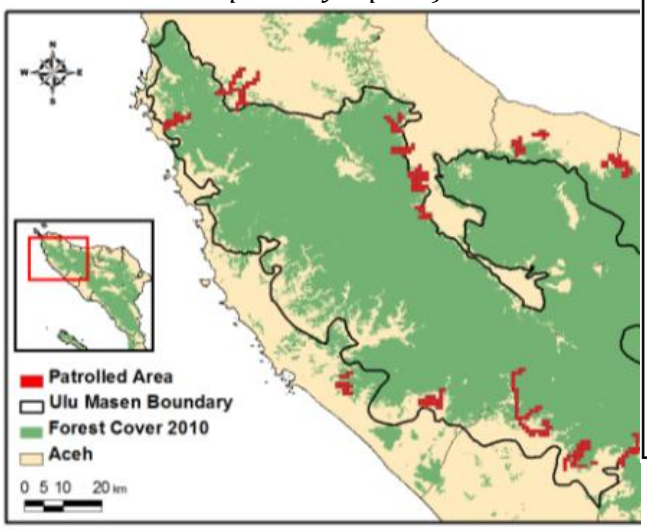


Complete study area in Ulu Masen and Leuser



Zoom in on Ulu Masen program area only

Figure 28. Ranger patrol coverage (cumulative, over quarterly reports)



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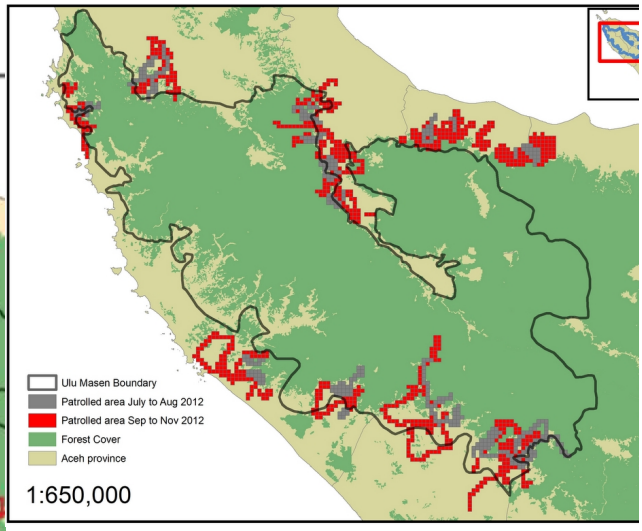
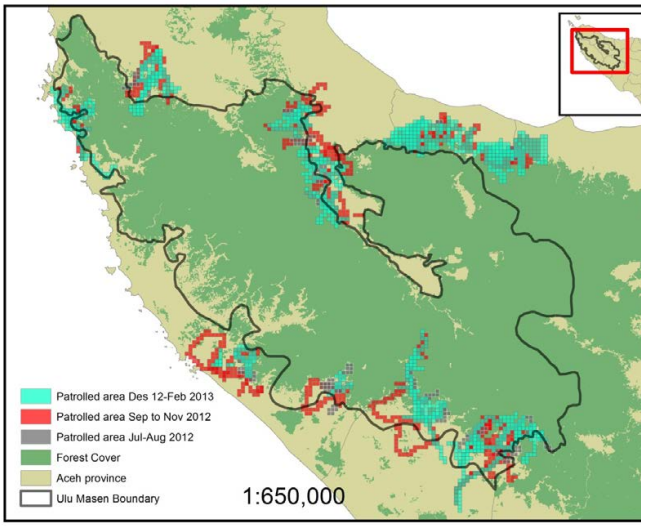


July 2012-November 2012



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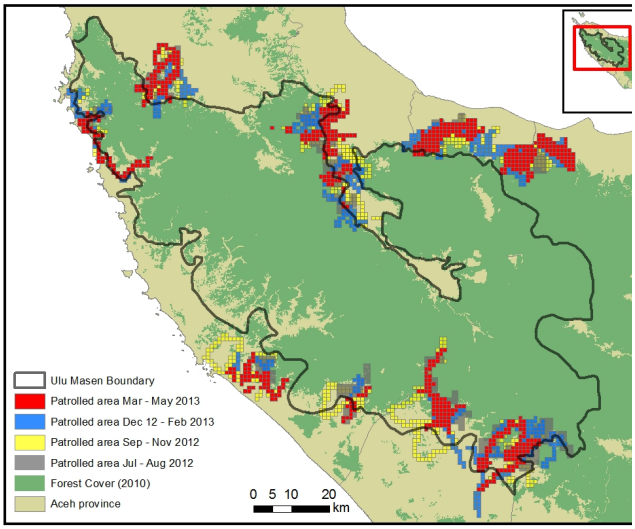


July 2012 – May 2013

Annex 5

Social outcomes

Table 6. Descriptive statistics for social outcomes - Village heads

	Mean	*Std. Dev.*	*Minimum*	*Maximum*	*Count*
Index A: Acceptance					
People here treat young people with respect	2.62	0.92	1	4	110
People here accept young people for who they are	2.98	0.75	1	4	110
Index B: Negative					
People here are afraid of young people	1.88	1.03	1	4	110
People here are suspicious of young people	2.16	0.96	1	4	110
People here are frustrated with young people	1.70	0.86	1	4	110
People here are jealous of young people	1.34	0.59	1	4	110
Index C: Decent					
Can young people live a decent life here?	2.48	0.70	1	4	110
Index D: Crime					
Number of robberies by young people	0.12	0.50	0	3	110
Number of young people in jail	0.18	0.73	0	6	110
Index E: Tension					
Importance of tension between young and old	1.12	0.38	1	3	110
Tension between young and old as biggest source of tension	0.04	0.19	0	1	110
Importance of tension between youth and police	1.11	0.31	1	2	110
Tension between youth and police as biggest source of tension	0.04	0.19	0	1	110

Table 7. Descriptive statistics for social outcomes - HH heads

	Mean	*Std. Dev.*	*Minimum*	*Maximum*	*Count*
Index A: Acceptance					
People here treat young people with respect	2.75	0.86	1	4	1120
People here accept young people for who they are	3.11	0.76	1	4	1120
Index B: Negative					
People here are afraid of young people	1.85	0.97	1	4	1120
People here are suspicious of young people	2.03	0.95	1	4	1120
People here are frustrated with young people	1.62	0.71	1	4	1120
People here are jealous of young people	1.42	0.64	1	4	1120
Index C: Decent					
Can young people live a decent life here?	1.77	0.79	1	4	1120
Index D: Tension					
Importance of tension between young and old	1.10	0.39	0	3	1120
Tension between young and old as biggest source of tension	0.02	0.12	0	1	1120
Importance of tension between youth and police	1.20	0.63	1	6	1120
Tension between youth and police as biggest source of tension	0.03	0.17	0	1	1120

Table 8. Impact estimates on social indices - Village heads

	Model 1 (no controls)			Model 2 (all controls)			Desired
	T.E.	s.e.	p-value	T.E.	s.e.	p-value	Direction
Panel A: Village head survey - Social outcomes							
(1) Acceptance	0.2	(0.20)	0.340	0.03	(0.22)	0.890	+
(2) Negative	-0.18	(0.18)	0.351	-0.16	(0.17)	0.353	-
(3) Decent life	-0.11	(0.22)	0.615	-0.19	(0.21)	0.358	+
(4) Crime	-0.15	(0.17)	0.389	-0.05	(0.23)	0.827	-
(5) Tension	-0.16	(0.16)	0.328	-0.21	(0.18)	0.255	-

* p<.10 ** p<.05 *** p<.01

Table 9. Impact estimates on social variables - Village heads

		Model 1 (no controls)			Model 2 (controls)			Desired
	Mean in controls	*Treatment Effect*	*s.e.*	*p-value*	*Treatment Effect*	*s.e.*	*p-value*	Direction
Index A: Acceptance								
People here treat young people with respect	2.5	0.22	(0.16)	0.166	0.01	(0.15)	0.948	+
People here accept young people for who they are	2.96	0.06	(0.20)	0.758	0.03	(0.23)	0.899	+
Index B: Negative								
People here are afraid of young people	2.1	-0.42	(0.25)	0.101	-0.62***	(0.22)	0.009	-
People here are suspicious of young people	2.21	-0.14	(0.19)	0.469	-0.12	(0.19)	0.534	-
People here are frustrated with young people	1.73	-0.12	(0.18)	0.505	-0.1	(0.15)	0.535	-
People here are jealous of young people	1.29	0.09	(0.09)	0.373	0.17**	(0.08)	0.041	-
Index C: Decent								
Can young people live a decent life here?	2.51	-0.08	(0.16)	0.615	-0.14	(0.15)	0.358	+
Index D: Crime								
Number of robberies by young people	0.18	-0.11	(0.09)	0.236	-0.11	(0.11)	0.349	-
Number of young people in jail	0.19	-0.05	(0.12)	0.713	0.04	(0.18)	0.811	-
Index E: Tension								
Importance of tension between young and old	1.15	-0.05	(0.05)	0.343	-0.1	(0.06)	0.114	-
Tension between young and old as biggest source of tension	0.05	-0.03	(0.03)	0.187	-0.05	(0.03)	0.105	-
Importance of tension between youth and police	1.12	-0.03	(0.05)	0.514	-0.05	(0.05)	0.289	-
Tension between youth and police as biggest source of tension	0.03	0	(0.03)	0.885	0	(0.03)	0.884	-

* p<.10, ** p<.05, *** p<.01

Table 10. Impact estimates on social indices - HH heads

	Model 1 (no controls)			Model 2 (all controls)			Desired
	T.E.	s.e.	p-value	T.E.	s.e.	p-value	Direction
Panel A: Household head survey - Social outcomes							
(1) Acceptance	-0.03	(0.09)	0.689	-0.15*	(0.08)	0.069	+
(2) Negative	-0.14*	(0.08)	0.098	-0.14	(0.08)	0.109	-
(3) Decent life	-0.20*	(0.10)	0.057	-0.28***	(0.09)	0.004	+
(4) Tension	-0.03	(0.05)	0.549	0.01	(0.06)	0.895	-

* p<.10 ** p<.05 *** p<.01

Table 11. Impact estimates on social variables – HH heads

		Model 1 (no controls)			Model 2 (controls)			Desired Direction
	Mean in controls	*Treatment Effect*	*s.e.*	*p-value*	*Treatment Effect*	*s.e.*	*p-value*	
Index A: Acceptance								
People here treat young people with respect	2.77	-0.01	(0.07)	0.925	-0.1	(0.07)	0.178	+
People here accept young people for who they are	3.12	-0.04	(0.07)	0.619	-0.1	(0.07)	0.126	+
Index B: Negative								
People here are afraid of young people	1.97	-0.15	(0.12)	0.204	-0.18*	(0.10)	0.083	-
People here are suspicious of young people	2.12	-0.11	(0.09)	0.250	-0.1	(0.08)	0.222	-
People here are frustrated with young people	1.64	-0.06	(0.05)	0.227	-0.05	(0.06)	0.375	-
People here are jealous of young people	1.43	-0.05	(0.05)	0.381	-0.04	(0.06)	0.527	-
Index C: Decent								
Can young people live a decent life here?	1.87	-0.17*	(0.08)	0.057	-0.23***	(0.07)	0.004	+
Index D: Tension								
Importance of tension between young and old	1.09	0.01	(0.03)	0.653	0.01	(0.04)	0.824	-
Tension between young and old as biggest source of tension	0.01	0	(0.01)	0.960	0	(0.01)	0.619	-
Importance of tension between youth and police	1.17	0.02	(0.05)	0.726	0.05	(0.05)	0.314	-
Tension between youth and police as biggest source of tension	0.04	-0.02**	(0.01)	0.047	-0.02	(0.01)	0.155	-

* p<.10, ** p<.05, *** p<.01

Annex 6

Environmental outcomes

Table 12. Impact estimates on environmental indices - HH heads

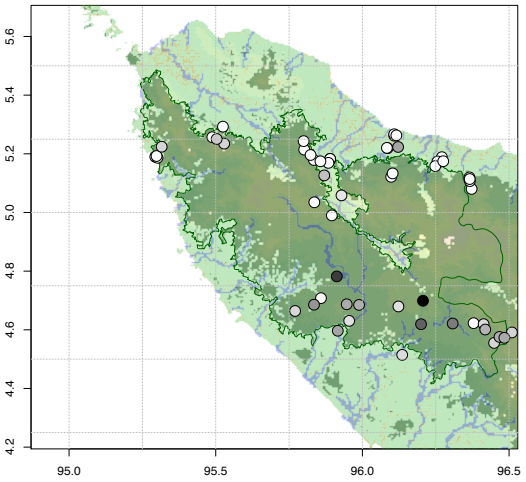
		Model 1 (no controls)			Model 2 (all controls)			Desired
		T.E.	s.e.	p-value	T.E.	s.e.	p-value	Direction
Panel A: Household head survey - Environmental outcomes								
1	Logging	-0.08	(0.06)	0.220	-0.11*	(0.06)	0.070	-
2	Mining	0.56***	(0.17)	0.004	0.42**	(0.20)	0.045	-
3	Community Awareness of Conservation	-0.09	(0.09)	0.317	-0.08	(0.09)	0.358	+
4	Animal Attacks	-0.11	(0.09)	0.251	-0.14*	(0.08)	0.094	-
5	Picking Up Trash	0.04	(0.09)	0.670	0.12	(0.09)	0.201	+
6	Conservation Institutions	-0.01	(0.11)	0.960	-0.02	(0.07)	0.766	+
7	Confidence in Stopping Logging	-0.15*	(0.08)	0.086	-0.18*	(0.10)	0.093	+
8	Confidence in Stopping Poaching	0.02	(0.09)	0.837	0.07	(0.09)	0.404	+
9	Disputes	-0.04	(0.08)	0.595	-0.03	(0.06)	0.574	-
10	Security from Animal Attacks	-0.11*	(0.06)	0.081	-0.1	(0.09)	0.275	-
11	Other Villagers' Opinions on Conservation	-0.13	(0.08)	0.136	-0.09	(0.11)	0.438	+
12	Household Heads' Own Opinions on Conservation	0.05	(0.09)	0.580	0.02	(0.09)	0.856	+
13	Knowledge of Environmental Regulation	0.18**	(0.08)	0.036	0.14	(0.10)	0.187	+
14	Benefits from REDD	-0.19*	(0.09)	0.058	-0.20**	(0.09)	0.045	-
15	Benefits from Conservation	0.17*	(0.08)	0.055	0.22**	(0.10)	0.038	+

* p<.10 ** p<.05 *** p<.01

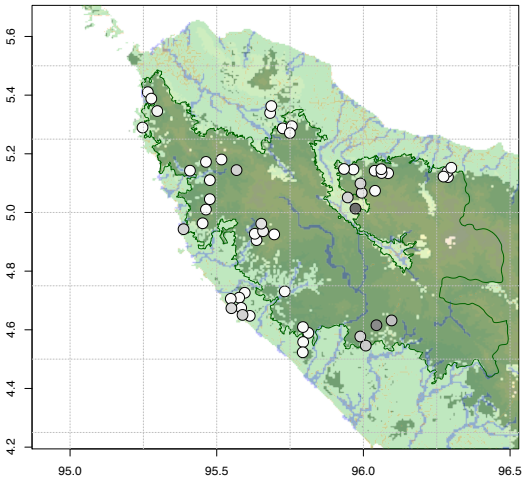
Table 13. Impact estimates on environmental variables - HH heads

		Model 1 (no controls)			Model 2 (controls)			Desired Direction
	Mean in controls	*Treatment Effect*	*s.e.*	*p-value*	*Treatment Effect*	*s.e.*	*p-value*	
Index A: Logging								
Did loggers hire from HH in last 12 months?	0.19	-0.06**	(0.03)	0.045	-0.05	(0.03)	0.130	-
Number of chainsaws in household	0.1	0.02	(0.03)	0.607	-0.01	(0.02)	0.753	-
Logging as income-generating activity	0.02	0	(0.01)	0.590	-0.01	(0.01)	0.445	-
Index B: Mining								
HH member has found gold near the village	0.11	0.20***	(0.06)	0.004	0.15**	(0.07)	0.045	-
Index C: Community Awareness of Conservation								
Knows that there is protected forest nearby	0.56	-0.03	(0.04)	0.498	-0.08	(0.05)	0.120	+
Knows that there is conservation forest nearby	0.1	-0.01	(0.02)	0.539	0	(0.02)	0.847	+
Knows that there is production forest nearby	0.2	-0.06	(0.06)	0.293	-0.06	(0.05)	0.231	+
Knows that there is state-owned forest nearby	0.56	-0.05	(0.04)	0.237	-0.08	(0.06)	0.146	+
Knows that there is community forest nearby	0.93	-0.03	(0.03)	0.298	-0.03	(0.03)	0.262	+
Knows not to hunt certain animals	0.83	0	(0.02)	0.994	-0.01	(0.02)	0.620	+
Knows which animals not to hunt	0.82	-0.01	(0.03)	0.748	-0.02	(0.03)	0.367	+
Is logging a problem here?	0.04	0	(0.02)	0.966	0.01	(0.02)	0.651	+
Is land clearing a problem here?	0.03	0.02	(0.02)	0.364	0.02	(0.01)	0.116	+
Is water affected by mining/roads/construction?	0.02	0.03	(0.02)	0.192	0.04**	(0.02)	0.018	+
Non-response: logging hires in HH	0.06	0.01	(0.02)	0.673	0.02	(0.03)	0.572	+
Non-response rate: daily payment for logging	0.54	0	(0.05)	0.964	-0.02	(0.06)	0.717	+
Non-response rate: daily payment for log transport	0.54	-0.01	(0.06)	0.903	-0.03	(0.07)	0.707	+
Non-response rate: HH member finding gold	0.02	0.01	(0.01)	0.311	0.01	(0.01)	0.210	+
Index D: Animal Attacks								
Elephant raid in last 12 months?	0.2	-0.05	(0.05)	0.332	-0.08	(0.05)	0.115	-
Tiger attack HH members in last 12 months?	0.01	0	(0.00)	0.645	0	(0.00)	0.893	-
Index E: Conservation Institutions								
Attend forest user grup meetings	0.24	0.02	(0.06)	0.746	0.01	(0.05)	0.807	+
Village had meetings to discuss forest land use	0.21	0.01	(0.02)	0.515	-0.01	(0.03)	0.721	+
Attended meetings to discuss forest land use	0.17	-0.01	(0.03)	0.634	-0.03	(0.03)	0.401	+
Spoke at meetings to discuss forest land use	0.12	-0.02	(0.03)	0.525	-0.03	(0.03)	0.254	+
HH participation in gotong royong	0.73	0.1	(0.14)	0.492	0.16	(0.16)	0.311	+
HH cleanup of forest/river in last 12 months	0.31	0.02	(0.04)	0.670	0.06	(0.04)	0.201	+
HH practices crop rotation	0.25	-0.06	(0.05)	0.247	-0.09**	(0.05)	0.047	+
Index F: Confidence in Stopping Logging								
Confidence in gov't ability to prevent logging	2.48	-0.14*	(0.08)	0.082	-0.14	(0.10)	0.170	+
Confidence in gov't will to prevent logging	2.3	-0.1	(0.09)	0.262	-0.15	(0.09)	0.123	+
Index G: Confidence in Stopping Poaching								
Confidence in gov't will to prevent poaching	2.24	-0.02	(0.07)	0.768	0.03	(0.08)	0.757	+
Confidence in gov't ability to prevent poaching	2.19	0.05	(0.08)	0.507	0.09	(0.07)	0.180	+
Index H: Disputes								
Engaged in land dispute	0.01	0	(0.01)	0.595	0	(0.01)	0.574	-
Index I: Security from Animal Attacks								
Lack of confidence in gov't ability to protect from attacks	2.22	-0.11*	(0.06)	0.081	-0.09	(0.08)	0.275	-
Index J: Other Villagers' Opinions on Conservation								
Others agree that conservation is more important than growth	2.77	-0.12	(0.12)	0.309	-0.1	(0.14)	0.488	+
Others agree that it is never okay to log	2.82	-0.03	(0.11)	0.804	-0.03	(0.11)	0.790	+
Others agree that gov't should control land use	3.09	-0.12	(0.11)	0.293	-0.07	(0.11)	0.550	+
Others agree that gov't should prevent logging for profit	2.84	-0.08	(0.13)	0.536	-0.04	(0.14)	0.758	+
Index K: Household Head's Opinions on Conservation								
Advocate nonviolent methods of controling animal problems	0.2	0.01	(0.06)	0.888	0.02	(0.06)	0.717	+
Importance of conservation to the world	3.95	-0.04*	(0.02)	0.074	-0.07**	(0.02)	0.011	+
Importance of conservation to the local area	3.87	0.02	(0.04)	0.692	-0.04	(0.05)	0.472	+
Agree that conservation is more important than growth	2.67	-0.09	(0.14)	0.537	-0.05	(0.16)	0.744	+
Agree that it is never ok to log	2.91	0.1	(0.09)	0.277	0.08	(0.09)	0.353	+
Agree that gov't should control land use	3.39	-0.14	(0.11)	0.210	-0.11	(0.08)	0.210	+
Agree that gov't should prevent logging for profit	3.18	-0.09	(0.13)	0.516	-0.11	(0.13)	0.401	+
Believe that conservation is a good use of local forest land	-0.5	0.06	(0.07)	0.410	0.04	(0.07)	0.545	+
Lack of reliance on forest products	3.57	0.10*	(0.05)	0.061	0.09	(0.05)	0.109	+
Disagree with proposals to use forest for economic growth	3.46	0.06	(0.09)	0.499	0.02	(0.07)	0.815	+
Desire to involve local land in such proposals	3.65	0.08	(0.05)	0.117	0.06	(0.05)	0.208	+
Index L: Knowledge of Environmental Regulation								
Did you learn anything about forest regulation during CRP?	0.04	0.05**	(0.02)	0.033	0.03	(0.03)	0.194	+
Has heard of REDD+ program	0.09	0.02	(0.02)	0.285	0.02	(0.03)	0.390	+
Index M: Benefits from REDD								
Belief that REDD+ projects will not benefit village	3.11	-0.18*	(0.09)	0.058	-0.18**	(0.09)	0.045	-
Index N: Benefits from Conservation								
Believe that forest use projects will not benefit household	3.08	0.16*	(0.08)	0.055	0.22**	(0.10)	0.038	+

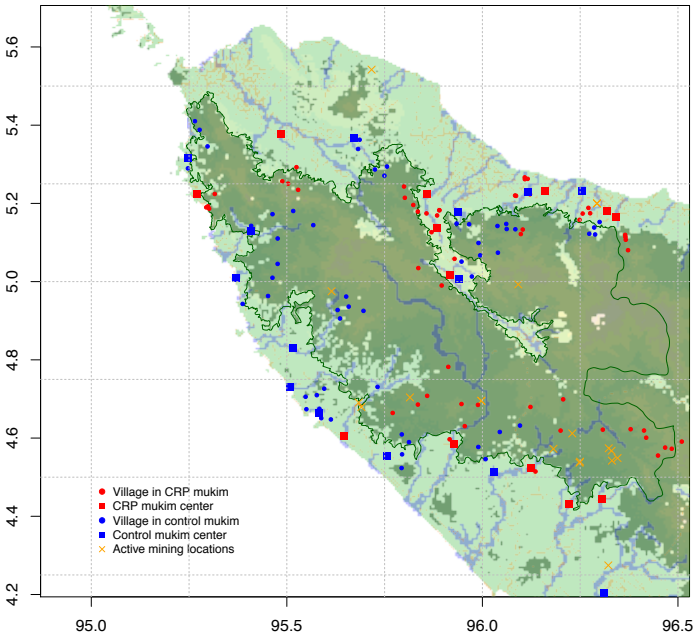
* p<.10, ** p<.05, *** p<.01



Panel 1: Mining intensity in CRP-treated villages (darker means more intensity)



Panel 2: Mining intensity in control villages (darker means more intensity)



Panel 3: Active mining locations as documented in the environmental assessments, relative to treated and control villages/mukim

Figure 29. Mining indicators in and around CRP-treated and control communities. The dark green area is forestland, the dark green line indicates the boundaries of the Ulu Masen protected system, and the orange-brown pixels in the bottom map indicate road density.

Table 14. Logging activity, economic conditions, and livelihood activity outcomes as correlates of mining intensity in treated areas

PANEL A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Logging indicators:												
												Joint significance p = 0.99
VH logging Index	0.09											0.04
	(0.18)											(0.30)
Env. Assess. logging index		0.02										-0.01
		(0.25)										(0.35)
YH: log in past year?			-1.20**									0.11
			(0.57)									(1.07)
Economic indicators:												
												Joint significance p = 0.39
YH: Objective economic index				-0.42								-0.42
				(0.29)								(0.30)
YH: subjective economic index					0.16							0.03
					(0.19)							(0.25)
Results of livelihood activities:												
												Joint significance p = 0.28
YH: livelihood activity has generated income						1.34**						2.10**
						(0.62)						(0.99)
YH: income received from livelihood activity							0.03					0.01
							(0.09)					(0.19)
YH: expected income from livelihood activity in 1 yr								-0.01				0.03
								(0.04)				(0.05)
YH: expected income from livelihood activity in 2 yrs									-0.04			-0.11**
									(0.04)			(0.05)
YH: expected income from livelihood activity in 5 yrs										-0.00		0.00
										(0.00)		(0.00)
YH: Satisfaction with CRP											0.05	-0.39
											(0.31)	(0.34)
Observations	56	56	47	47	47	47	47	47	47	47	47	47

All regressors are village level averages.

PANEL B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Logging indicators:												
												Joint significance p = 0.95
VH logging Index	0.09											0.09
	(0.18)											(0.28)
Env. Assess. logging index		0.02										-0.09
		(0.25)										(0.32)
YH: log in past year?			-0.90*									0.37
			(0.45)									(0.65)
Economic indicators:												
												Joint significance p = 0.30
YH (CRP participants): Objective economic index				-0.37								-0.37
				(0.24)								(0.24)
YH (CRP participants): subjective economic index					0.09							-0.15
					(0.24)							(0.26)
Results of livelihood activities:												
												Joint significance p = 0.30
YH (CRP participants): livelihood activity has generated income						0.92*						1.75**
						(0.47)						(0.73)
YH (CRP participants): income received from livelihood activity							-0.06					-0.01
							(0.08)					(0.12)
YH (CRP participants): expected income from livelihood activity in 1 yr								-0.02				0.01
								(0.02)				(0.02)
YH (CRP participants): expected income from livelihood activity in 2 yrs									-0.03			-0.05
									(0.02)			(0.04)
YH (CRP participants): expected income from livelihood activity in 5 yrs										-0.00		0.00*
										(0.00)		(0.00)
YH (CRP participants): Satisfaction with CRP											-0.33	-0.34
											(0.23)	(0.36)
Observations	56	56	47	47	47	47	47	47	47	47	47	47

All regressors are village level averages, with YH regressors being averages for CRP-participant youth.

(cont'd on next page)

PANEL C											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Logging indicators:											
											Joint significance p = 0.65
VH logging Index	0.09										0.26
	(0.18)										(0.30)
Env. Assess. logging index		0.02									0.33
		(0.25)									(0.59)
YH: log in past year?			-1.00								-1.86
			(0.78)								(1.71)
Economic indicators:											
											Joint significance p = 0.87
YH (control youth): Objective economic index				-0.07							0.05
				(0.20)							(0.32)
YH (control youth): subjective economic index					-0.07						-0.08
					(0.16)						(0.15)
Results of livelihood activities:											
											Joint significance p = 0.09
YH (control youth): livelihood activity has generated income						-4.36**					1.30
						(1.96)					(3.55)
YH (control youth): expected income from livelihood activity in 1 yr							-0.67***				-1.56*
							(0.19)				(0.78)
YH (control youth): expected income from livelihood activity in 2 yrs								-0.22*			0.27
								(0.13)			(0.28)
YH (control youth): expected income from livelihood activity in 5 yrs									-0.05**		0.08
									(0.02)		(0.12)
YH (control youth): Satisfaction with CRP										-0.93**	-0.40
										(0.45)	(0.84)
Observations	56	56	47	47	47	47	47	47	47	47	47

All regressors are village level averages, with YH regressors being averages for control youth.
All regressions control for village head characteristics (age, education), village size, share of village in farming, percent poor, whether village is served by roads, presence of excombatants in village, and experimental stratum fixed effects.
Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Annex 7

Spillover effects

The experimental design established randomized treatment and control sets of mukims and youth within mukims with which we can estimate program effects. At the same time, we faced the possibility of treatment spillovers contaminating our control group. At the mukim level, it is possible that awareness of program activities and exposure to such activities could have traveled from treated into control mukims. At the individual youth level, candidates that were not selected were from the same villages as those that were selected. The non-selected candidates may harbor negative sentiments as a result of being left out. Or, it may be that benefits realized by those selected as rangers could affect outcomes among those not selected, whether in the form of positive spillovers (e.g., if any material benefits were shared within a village) or negative spillovers (e.g., if those selected were in a better position to secure rival opportunities). Finally, at the forest level, it was unclear to us a priori whether any deterrence effects on forest degradation would be local to forest areas adjacent to treated mukims or whether broader knowledge of the existence of the ranger program would result in the deterrence of forest degradation in the broader Ulu Masen forest system.

At the individual youth level, there are a number of different ways that spillover could have occurred. The candidates that were not selected were from the same villages as those that were selected. The non-selected candidates may harbor negative sentiments as a result of being left out. Or, it may be that benefits realized by those selected as rangers could affect outcomes among those not selected, whether in the form of positive spillovers (e.g., if any material benefits were shared

within a village) or negative spillovers (e.g., if those selected were in a better position to secure rival opportunities).

Finally, at the forest level, it was unclear to us a priori whether any deterrence effects on forest degradation would be local to forest areas adjacent to treated mukims or whether broader knowledge of the existence of the ranger program would result in the deterrence of forest degradation in the broader Ulu Masen forest system.

We faced a number of constraints on what we could do to evaluate such spillover effects. A first best approach to deal with spillovers is a hierarchical design that randomly assigns some areas to be sufficiently isolated from treated areas such that spillover potential is essentially nil (Duflo and Saez 2003; Sinclair et al. 2012). Implementing such a design requires that one knows, a priori, what degree of isolation is sufficient. In our case, the mukim were already located far enough from each other so as to mitigate major spillover concerns. However, to the extent that forest degradation activities are made at the level of the *forest system*, there would be no treatment assignment within the Ulu Masen system that would fully convince skeptics. At the same time, programming was constrained to operate in Ulu Masen alone, and so the only way that we could obtain a sample of forest areas that was totally non-sensitive to program spillovers would be to sample from outside the Ulu Masen system. As a second-best approach, we identified areas in the nearby Leuser forest system that would serve as non-randomized controls for the evaluation of spillover effects. The Leuser areas were selected on the basis of in-depth consideration of areas in terms of their ecological and social comparability to our study sites in Ulu Masen. From within these areas deemed as comparable, we then used covariate matching to identify precise subdistricts adjacent to the Leuser reserve to serve as non-randomized controls.

For evaluating youth spillovers, we also faced constraints and therefore had to rely on assembling a sample of non-experimental controls. In this case, the ideal approach would have been to run a candidate recruitment drive in the control villages so as to assemble sets of youth comparable, on the basis of observed and unobserved candidate pool selection criteria, as those in the program villages. We were unable to do that as it would have required doubling the scale of the candidate pool construction process, and resources were not available. Thus, we also rely on matching on the basis of observed covariates to construct our non-experimental control group to evaluate possible youth spillovers.

Social outcomes

The ranger randomization enables us to estimate unbiased treatment effects based on contrasts between young men and women *from within mukims* that hosted CRP activities. Such within-mukim contrasts provide an unbiased estimate of treatment effects to the extent that the program effects do not spillover across treatment and control youth from the same mukim. To evaluate the possibility of spillover as described above, we use data from two additional control groups: (1) youths in control mukim (mukim that did not participate in CRP but that were randomly assigned to control); and (2) youths in Leuser mukim.

We stress these are *observational* control groups—even in control mukim—and therefore should be considered a secondary robustness check of the main experimental analysis. The main challenge arises with identifying youths that are comparable to the candidate youths in CRP mukim. This is challenging because candidate rangers went through a selection process that could not be replicated as part of the endline data collection. This selection process means that candidate rangers could differ substantially from the general population of youths in control and Leuser

mukim. We attempted to address this in two ways: (1) youths that were broadly similar to CRP youths were sampled; and (2) with the sample we obtained, we used the weighting procedure described in section 8.3.2 above to ensure that sampled youth in control mukim are as similar as possible to the treatment group.[3] When sampling in control and Leuser mukim, youth were randomly sampled from within the age bracket of 19-35 years old. We aimed to achieve balance in the proportion of females in the treatment and non-treatment location (9%) by restricting the sample accordingly. Within a given mukim (4 villages) in the first and third villages, only males were included in the list for selection. In the second and fourth sampled villages, the first household contained only females while households 2-5 only males. This ensured that 2/20 in each mukim were women, which matches our distribution in the CRP treatment/control mukim. Overall, we have a sample of 280 observational controls in non-CRP mukim and 283 observational controls in Leuser mukim.

Table 15 shows results for the outcome indices, and

[3] We applied the weighting procedure using the following variables (measured in the endline survey but capturing pre-program conditions): age, ethnicity, pre-program employment, reported pre-program life satisfaction, pre-program conflict experience, and status as a member of GAM or another conflict-era armed organization (refer to **Error! Reference source not found.**).

Table 16 to Table 20 unpack the index effects and show results for the component variables. There are substantial differences between the observational controls and the experimental control but the results presented in Table 15 suggest that observational controls are *worse off* than experimental controls. For instance, their scores for the subjective economic well being (Econ subjective), human capital, life satisfaction and self-esteem (Panel C), and acceptance (Accept1) are all lower than the experimental control group. Similarly, observational controls are more likely than experimental controls to have engaged in a physical fight (Panel E). This suggests that there might indeed be some spillovers from treated rangers to control rangers, but these would all have been positive spillovers, meaning that control rangers experienced positive externalities from the CRP program. This also would suggest that positive treatment effects picked up in Section 12 would likely underestimate the true effect, meaning that the true treatment effect would appear even bigger if control rangers had not experienced positive externalities.

Environmental outcomes

In Section 11 on CRP implementation, we saw that ranger activities did not extend into areas outside the mukims in which they were based or adjacent forestlands. As such, there is no reason to believe that there could have been effects on environmental outcomes resulting from any *direct* exposure to CRP activities. Nevertheless, there remains the possibility of "displacement" or "leakage" effects—for example, activities such as illegal logging or poaching that were deterred in areas that were exposed to CRP patrols may have been displaced into areas that were not covered. We examine the potential for this kind of spillover by comparing control villages in Ulu Masen to matched villages in Leuser (see Table 1). As with the analyses above, we did all that we could with available data to establish a reasonable comparison. However to the extent that differences are recorded, we cannot really say whether they are due to spillover effects of the program or due to differences between the Ulu Masen and Leuser areas for which we failed to account in our matching procedure. It would be prudent to evaluate the results on a case-by-case basis, taking into consideration whether a spillover effect is a more plausible explanation or an unaccounted-for difference in general conditions that prevail in the Ulu Masen area versus the Leuser area.

The results of the comparisons between Ulu Masen control villages and matched Leuser villages are shown in Table 21 to Table 23. We see no clear evidence of displacement effects for logging or poaching. We do however see evidence for a displacement effect of mining. This is strongly evident in both the village head surveys and the environmental assessments. It is less pronounced in the household survey, although those results rely on a single measure and so are bound to be much noisier. When considered alongside the substantial increase in mining in CRP areas that we documented above, the fact that we have lower mining in the Ulu Masen control villages than in their matched counterparts in Leuser could be indicative of either of two things: (i) mining that would otherwise have taken place in the Ulu Masen control areas was drawn into the CRP areas as a result of the program or (ii) the Ulu Masen area was a place where mining occurred with much less regularity than the Leuser areas, but that the CRP program changed this and result in an increase in mining up to levels that are similar to what is already common in Leuser. We also find that animal attacks were more of a problem in the Ulu Masen control areas than the matched Leuser areas (apparent from the village heads and household heads surveys). We had found some suggestive evidence that CRP communities had fewer animal attacks, and so combined with the results from the comparison of Ulu Masen and Leuser controls, there is indication that attacks (primarily elephant raids) were to some extent displaced rather than being removed entirely.

The differences that we record in conservation institutions and respondents' attitudes and perceptions presumably speak to differences in the Ulu Masen versus Leuser social contexts as opposed to any spillover effects. Looking at the household survey results for example (Table 23),

we see that household heads from the Ulu Masen communities tend to be more confident in the government's ability to stop logging and also to express more support from themselves and from their co-villagers in the value of forest conservation. The results from the village heads survey were similar, although a bit more mixed. At the same time household heads in Ulu Masen were quite a bit more skeptical about REDD. If Ulu Masen communities tended already to exhibit relatively high levels of support for conservation as is apparent when comparing them to Leuser communities, there may have been little room for improvement. In that case it may not be surprising that there was so little movement in these outcomes as a result of the CRP.

Table 15. Social outcomes indices (comparing control groups) - Youth surveys

		CONTROL MUKIM						LEUSER MUKIM					
		Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
		coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Economic outcomes													
(1)	Econ subjective	-0.14	(.14)	0.320	-0.13	(.14)	0.330	-0.22	(.16)	0.185	-0.23	(.17)	0.178
(2)	Econ objective	-0.30**	(.14)	0.037	-0.29**	(.14)	0.036	0.01	(.14)	0.917	0.02	(.13)	0.900
(3)	Human capital	-0.34***	(.09)	0.000	-0.33***	(.08)	0.000	-0.10	(.16)	0.547	-0.12	(.16)	0.448
Panel B: Rooted + Family + Friends													
(4)	Rooted	.23**	(.10)	0.026	.23***	(.08)	0.003	-0.03	(.12)	0.780	-0.01	(.10)	0.925
(5)	Family relations	-0.08	(.11)	0.459	-0.07	(.11)	0.531	-0.44***	(.16)	0.006	-0.44***	(.15)	0.005
(6)	Peers1	-0.24**	(.10)	0.022	-0.23**	(.11)	0.032	-0.43***	(.13)	0.001	-0.43***	(.13)	0.001
(7)	Peers2	0.06	(.23)	0.791	0.05	(.24)	0.844	.23*	(.14)	0.092	0.21	(.13)	0.110
Panel C: Outlook/esteem													
(8)	Life satisfaction	-0.32***	(.11)	0.005	-0.24***	(.08)	0.002	0.02	(.12)	0.867	-0.02	(.06)	0.792
(9)	Esteem1	-0.44***	(.16)	0.006	-0.43***	(.15)	0.004	-0.38***	(.14)	0.005	-0.40***	(.12)	0.001
(10)	Esteem2	-0.34***	(.12)	0.005	-0.32**	(.13)	0.011	-0.28*	(.14)	0.051	-0.29**	(.14)	0.037
Panel D: Acceptance													
(11)	Participation	-0.20	(.13)	0.119	-0.18	(.12)	0.122	-0.31**	(.12)	0.014	-0.30**	(.12)	0.015
(12)	Accept1	-0.36***	(.12)	0.002	-0.36***	(.11)	0.002	-0.19*	(.10)	0.056	-0.20*	(.10)	0.063
(13)	Accept2	-0.12	(.10)	0.242	-0.11	(.10)	0.268	-0.24	(.17)	0.171	-0.25	(.17)	0.135
Panel E: Bad Behavior													
(14)	Tensions in village	-0.12	(.12)	0.310	-0.08	(.12)	0.496	.34*	(.19)	0.070	.36*	(.18)	0.054
(15)	Fighting in village	.30*	(.16)	0.061	.31**	(.15)	0.047	.28**	(.12)	0.017	.27**	(.11)	0.017
(16)	Logging	0.09	(.11)	0.452	0.08	(.12)	0.520	0.13	(.17)	0.448	0.13	(.16)	0.399
(17)	Encounters with police	-0.13	(.13)	0.325	-0.14	(.13)	0.285	-0.01	(.12)	0.937	-0.01	(.11)	0.926

* p<.10, ** p<.05, *** p<.01

Table 16. Economic outcomes (comparing controls) - Youth surveys

	CONTROL MUKIM						LEUSER MUKIM					
	Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Econ objective												
(1) Total income (logged)	-0.02	(.12)	0.850	-0.02	(.12)	0.864	0.20	(.14)	0.171	0.20	(.14)	0.159
(2) Water from a protected source	-0.04	(.07)	0.583	-0.05	(.07)	0.521	-0.06	(.11)	0.604	-0.06	(.11)	0.571
(3) Floor made of high quality materials	-.12**	(.06)	0.050	-.12*	(.06)	0.069	-0.04	(.04)	0.383	-0.04	(.04)	0.382
(4) Walls made of high quality materials	-0.11	(.07)	0.120	-0.10	(.07)	0.151	-0.06	(.11)	0.576	-0.06	(.11)	0.582
(5) Cook with gas/electricity	0.08	(.07)	0.299	0.08	(.07)	0.216	-.24***	(.06)	0.000	-.25***	(.07)	0.000
Panel B: Econ subjective												
(6) Income higher than other people my age	-0.01	(.10)	0.914	0.00	(.09)	0.991	0.00	(.08)	0.975	0.00	(.08)	0.968
(7) Living comfortably at present income	-0.16	(.10)	0.111	-0.16	(.10)	0.104	0.03	(.11)	0.784	0.05	(.11)	0.685
(8) Economic condition now better than 2 yrs ago	-.27***	(.08)	0.001	-.27***	(.08)	0.001	-0.08	(.08)	0.306	-0.08	(.07)	0.250
(9) Economic condition in two years better than now	-0.02	(.09)	0.795	-0.01	(.08)	0.867	0.13	(.11)	0.232	0.13	(.10)	0.210
Panel C: Human capital												
(10) Highest level of education completed	-.33***	(.09)	0.001	-.32***	(.08)	0.000	-0.15	(.12)	0.196	-.18*	(.11)	0.091
(11) Numeracy (based on math quiz)	-.25*	(.14)	0.070	-.24*	(.14)	0.076	0.01	(.23)	0.963	0.01	(.24)	0.983

* p<.10, ** p<.05, *** p<.01

Table 17. Network outcomes (comparing controls) - Youth surveys

	CONTROL MUKIM						LEUSER MUKIM					
	Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Rooted												
(1) Married	.14**	(.06)	0.016	.14***	(.05)	0.002	0.01	(.07)	0.831	0.02	(.06)	0.679
(2) Children	0.12	(.09)	0.199	0.11	(.08)	0.158	-0.07	(.11)	0.520	-0.05	(.10)	0.591
(3) Head of household	.12**	(.05)	0.023	.12***	(.04)	0.003	-0.01	(.05)	0.911	0.01	(.05)	0.910
Panel B: Family relations												
(4) Family relations close	-0.01	(.04)	0.761	-0.01	(.03)	0.822	-.14***	(.05)	0.009	-.14***	(.05)	0.007
(5) Family concerned about you	-0.02	(.05)	0.671	-0.01	(.05)	0.759	-0.02	(.06)	0.783	-0.02	(.06)	0.766
(6) Rarely argue with family	-0.08	(.13)	0.545	-0.07	(.13)	0.569	-.38**	(.16)	0.015	-.39**	(.16)	0.015
Panel C: Peers1												
(7) Peers are interested in school	-.10*	(.06)	0.079	-.10*	(.05)	0.062	-0.04	(.07)	0.591	-0.04	(.07)	0.524
(8) Peers participate in community meetings	-0.05	(.04)	0.261	-0.05	(.04)	0.269	-.08**	(.03)	0.013	-.08**	(.03)	0.016
(9) Peers go to mosque regularly	-.13***	(.05)	0.006	-.13***	(.05)	0.007	-.26***	(.07)	0.000	-.26***	(.07)	0.001
(10) Peers work hard	0.06	(.04)	0.142	0.06	(.04)	0.127	-.13***	(.05)	0.004	-.13***	(.05)	0.005
(11) Peers earn income	-0.01	(.06)	0.839	0.00	(.06)	0.936	-0.05	(.04)	0.289	-0.04	(.04)	0.315
(12) Trust peers	-0.04	(.03)	0.267	-0.04	(.03)	0.144	-0.02	(.03)	0.430	-0.03	(.03)	0.268
Panel D: Peers2												
(13) Peers do not drink	.10**	(.05)	0.041	.10*	(.05)	0.054	.14***	(.04)	0.001	.14***	(.04)	0.000
(14) Peers are not ex-combatants	0.01	(.05)	0.905	0.01	(.05)	0.913	0.01	(.04)	0.864	0.01	(.04)	0.798
(15) Peers do not fight	-0.05	(.05)	0.263	-0.05	(.05)	0.288	-0.03	(.05)	0.526	-0.03	(.05)	0.553
(16) Peers are not loggers	-0.05	(.06)	0.412	-0.06	(.06)	0.287	0.02	(.05)	0.753	0.00	(.05)	0.924

* p<.10, ** p<.05, *** p<.01

Table 18. Esteem outcomes (comparing controls) – Youth surveys

	CONTROL MUKIM						LEUSER MUKIM					
	Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Life satisfaction												
(1) Life satisfaction now (10 step ladder)	-.50**	(.23)	0.030	-.39**	(.17)	0.020	-0.05	(.25)	0.842	-0.09	(.22)	0.687
(2) Life satisfaction two years ago (10 step ladder)	-0.18	(.24)	0.469	0.00	(.00)	0.951	0.09	(.20)	0.647	0.00	(.00)	0.774
(3) Life satisfaction in one year (10 step ladder)	-.59***	(.21)	0.007	-.48**	(.20)	0.015	-0.27	(.25)	0.278	-0.32	(.20)	0.105
(4) Life satisfaction in five years (10 step ladder)	-.91***	(.27)	0.001	-.82**	(.32)	0.011	-0.08	(.28)	0.785	-0.12	(.25)	0.644
Panel B: Esteem1												
(5) Satisfied with yourself	-.29***	(.08)	0.000	-.29***	(.08)	0.000	-0.18	(.11)	0.105	-.19*	(.11)	0.079
(6) Enjoy convincing others of your opinion	-0.15	(.09)	0.101	-.18*	(.09)	0.058	-.26**	(.11)	0.027	-.27**	(.11)	0.020
(7) Like to assume responsibility	-.20*	(.11)	0.068	-.18*	(.10)	0.072	-.30***	(.09)	0.001	-.30***	(.08)	0.000
(8) Usually successful and everything I do	-0.07	(.09)	0.459	-0.06	(.08)	0.484	-0.12	(.10)	0.228	-0.12	(.09)	0.188
(9) Often give advice to others	-.17**	(.08)	0.032	-.16**	(.07)	0.029	-.12*	(.07)	0.097	-.12*	(.06)	0.055
(10) Look for ways to resolve conflict	-0.15	(.10)	0.126	-0.14	(.10)	0.141	0.01	(.10)	0.886	0.01	(.09)	0.891
Panel C: Esteem 2												
(11) Disagree that everything you try fails	-.15*	(.09)	0.092	-0.14	(.09)	0.122	-0.07	(.10)	0.479	-0.07	(.10)	0.469
(12) Disagree that you are a good person but doing nothing	-.25**	(.10)	0.013	-.24**	(.11)	0.028	-0.07	(.11)	0.481	-0.08	(.10)	0.420
(13) Disagree that you do not have much to be proud of	-0.09	(.09)	0.335	-0.09	(.09)	0.346	-.28**	(.12)	0.027	-.28**	(.12)	0.025

* p<.10, ** p<.05, *** p<.01

Table 19. Participation and acceptance outcomes (comparing controls) – Youth surveys

		CONTROL MUKIM						LEUSER MUKIM					
		Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
		coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Participation													
(1)	Contribute labor/money to gotong royong	-0.07	(.06)	0.258	-0.07	(.06)	0.242	0.09	(.07)	0.208	0.10	(.07)	0.171
(2)	Attend village meetings	0.01	(.04)	0.876	0.00	(.04)	0.965	-0.15***	(.05)	0.004	-0.14***	(.05)	0.005
(3)	Spoke at village meetings	-0.19***	(.07)	0.007	-0.19***	(.07)	0.008	-0.21***	(.06)	0.002	-0.21***	(.06)	0.001
(4)	Participate in farmers group	-0.16	(.14)	0.258	-0.14	(.14)	0.303	-0.24	(.17)	0.146	-0.22	(.15)	0.148
(5)	Particpate in credit/finance group	-0.04	(.07)	0.583	-0.05	(.07)	0.521	-0.06	(.11)	0.604	-0.06	(.11)	0.571
(6)	Participate in community dev group	-0.28**	(.12)	0.018	-0.24**	(.11)	0.035	-0.23	(.16)	0.146	-0.21	(.15)	0.147
(7)	Participate in livelihoods benefits group	-0.19	(.13)	0.157	-0.15	(.13)	0.245	-0.20	(.15)	0.189	-0.19	(.15)	0.206
(8)	Particpate in forest users group	0.04	(.11)	0.724	0.03	(.11)	0.797	-0.08	(.15)	0.582	-0.09	(.15)	0.567
(9)	Participate in women's group	0.07	(.13)	0.570	0.07	(.13)	0.605	-0.11	(.09)	0.254	-0.11	(.09)	0.223
(10)	Participate in youth group	-0.26	(.17)	0.117	-0.25	(.16)	0.130	-0.07	(.13)	0.596	-0.06	(.13)	0.614
Panel B: Accept 1													
(11)	Respect relative to others your age	-0.10*	(.05)	0.069	-0.10**	(.05)	0.044	0.01	(.07)	0.834	0.01	(.06)	0.840
(12)	Tried to resolve conflict in village	-0.06	(.08)	0.439	-0.05	(.08)	0.489	0.01	(.07)	0.912	0.01	(.07)	0.875
(13)	People in the village treat me with respect	-0.32	(.21)	0.137	-0.33	(.20)	0.103	-0.11	(.14)	0.433	-0.12	(.13)	0.385
(14)	People in the village accept me	-0.14**	(.07)	0.040	-0.13**	(.06)	0.033	-0.26**	(.11)	0.021	-0.27**	(.10)	0.011
Panel C: Accept 2													
(15)	People in the village do not fear me	-0.03	(.06)	0.643	-0.03	(.06)	0.589	-0.07	(.10)	0.486	-0.08	(.10)	0.407
(16)	People in the village are not suspicious of me	-0.09	(.06)	0.170	-0.08	(.07)	0.249	-0.07	(.06)	0.223	-0.08	(.06)	0.239
(17)	People in the village are not frustrated with me	-0.02	(.04)	0.662	-0.01	(.04)	0.726	-0.07	(.06)	0.258	-0.07	(.06)	0.207
(18)	People in the village are not jealous of me	-0.06	(.08)	0.511	-0.05	(.08)	0.501	-0.14	(.14)	0.338	-0.14	(.14)	0.339

* p<.10, ** p<.05, *** p<.01

Table 20. Bad behavior outcomes (comparing controls) – Youth surveys

		CONTROL MUKIM						LEUSER MUKIM					
		Model 1 (no controls)			Model 2 (controls)			Model 1 (no controls)			Model 2 (controls)		
		coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*
Panel A: Tensions in village													
(1)	Tensions between young and old	-0.06	(.06)	0.329	-0.04	(.06)	0.485	0.12	(.08)	0.146	0.13	(.08)	0.121
(2)	Tensions between youth and police	-0.05	(.07)	0.488	-0.03	(.07)	0.669	.20*	(.11)	0.075	.20*	(.11)	0.058
Panel B: Fighting in village													
(3)	Disputes with anyone in village	.05**	(.02)	0.041	.05**	(.02)	0.027	0.03	(.02)	0.157	0.03	(.02)	0.175
(4)	Physical fighting	0.04	(.03)	0.114	0.04	(.03)	0.107	.06***	(.02)	0.006	.06***	(.02)	0.005
Panel C: Logging													
(5)	Asked to log in past year	-0.02	(.04)	0.544	-0.03	(.04)	0.474	-0.04	(.05)	0.411	-0.04	(.04)	0.373
(6)	Logged in past year	-0.03	(.04)	0.458	-0.03	(.04)	0.405	0.03	(.05)	0.585	0.03	(.04)	0.541
(7)	Believe its ok to log	.29**	(.14)	0.044	.30**	(.14)	0.029	0.26	(.19)	0.165	0.27	(.19)	0.143
Panel D: Encounters with police													
(8)	Harrassed by the police	-0.01	(.03)	0.726	-0.01	(.03)	0.710	0.00	(.03)	0.986	0.00	(.03)	0.987
(9)	Arrested by the police	0.00	(.02)	0.949	0.00	(.02)	0.945	-0.01	(.02)	0.362	-0.01	(.01)	0.338
(10)	Accused of a crime	-0.05	(.03)	0.154	-0.05	(.03)	0.121	0.01	(.03)	0.680	0.01	(.03)	0.641

* p<.10, ** p<.05, *** p<.01

Table 21. Environmental outcomes (comparing controls) - Village head survey

	COMPARISON OF ULU MASEN CONTROLS VS MATCHED LEUSER ViLLAGES									
	Model 1 (no controls)			Model 2 (key controls)			Model 3 (key controls + imbalanced covariates)			D
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	Di
Panel A: Indices										
Logging	0.06	(0.20)	0.78	-0.30	(0.22)	0.20	-0.29	(0.25)	0.28	
Mining	-0.56**	(0.24)	0.04	-0.58**	(0.21)	0.02	-0.71*	(0.40)	0.09	
Poaching	-0.02	(0.16)	0.88	-0.04	(0.16)	0.79	0.14	(0.20)	0.50	
Community Awareness of Conservation	-0.06	(0.16)	0.72	-0.29	(0.25)	0.27	-0.38	(0.23)	0.12	
Animal Attacks	0.63**	(0.22)	0.01	0.50**	(0.22)	0.04	0.43*	(0.22)	0.07	
Conservation Institutions	0.25	(0.16)	0.15	-0.07	(0.15)	0.65	0.22	(0.14)	0.15	
Confidence in Stopping Logging	0.32	(0.23)	0.18	0.29	(0.19)	0.15	0.01	(0.18)	0.98	
Confidence in Stopping Poaching	0.14	(0.13)	0.30	0.16	(0.21)	0.47	0.33*	(0.18)	0.09	
Disputes	0.05	(0.18)	0.81	-0.16	(0.17)	0.35	-0.07	(0.31)	0.81	
Security from Animal Attacks	-0.27	(0.29)	0.36	-0.36	(0.31)	0.27	-0.54	(0.37)	0.16	
Other Villagers' Opinions on Conservation	0.61***	(0.13)	0.00	0.75***	(0.19)	0.00	1.30***	(0.21)	0.00	
Village Heads' Opinions on Conservation	-0.39***	(0.13)	0.01	-0.40**	(0.14)	0.01	-0.18	(0.19)	0.36	
Benefits from REDD	-0.11	(0.15)	0.47	-0.09	(0.14)	0.52	-0.23	(0.16)	0.18	
Benefits from Conservation	0.08	(0.16)	0.62	0.33	(0.19)	0.10	0.47**	(0.21)	0.04	
Panel B: Logging										
Did loggers hire here in last 12 months?	0.13	(0.08)	0.10	0.08	(0.09)	0.41	0.11	(0.11)	0.35	
Percent of households that logged in last 12 months	-1.72	(1.26)	0.20	-4.17***	(1.11)	0.00	-5.29***	(1.19)	0.00	
Percent of households with chainsaws	-0.35	(1.10)	0.75	-2.35*	(1.12)	0.06	-1.90	(1.32)	0.17	
Panel C: Mining										
Have people found gold near the village?	-0.05	(0.07)	0.53	-0.06	(0.08)	0.47	-0.04	(0.10)	0.72	
Percet of households that mined near the village	-11.21***	(3.55)	0.01	-11.27***	(2.45)	0.00	-15.10**	(6.24)	0.03	
Panel D: Poaching										
Does illegal poaching happen here?	0.00	(0.03)	0.88	-0.01	(0.03)	0.79	0.02	(0.04)	0.50	
Panel E: Community Awareness of Conservation										
Knowledge of protected forests/animals	-0.01	(0.03)	0.72	-0.06	(0.05)	0.27	-0.07	(0.04)	0.12	
Panel F: Animal Attacks										
Have animal attacks happened here?	0.26**	(0.09)	0.01	0.21**	(0.09)	0.04	0.18*	(0.09)	0.07	
Panel G: Conservation Institutions										
Does the village have a forest users group?	0.09	(0.07)	0.20	0.01	(0.04)	0.74	0.01	(0.08)	0.86	
Frequency of meetings to discuss forest use	-0.18	(0.17)	0.31	-0.54**	(0.21)	0.02	-0.42**	(0.19)	0.04	
Percent of households that practice crop rotation	12.63**	(5.22)	0.03	12.56**	(4.90)	0.02	23.91***	(4.63)	0.00	
Panel H: Confidence in Stopping Logging										
Confidence in gov't ability to prevent logging	-0.13	(0.15)	0.41	-0.16	(0.13)	0.24	-0.40**	(0.15)	0.02	
Confidence in gov't will to prevent logging	0.58**	(0.22)	0.02	0.55**	(0.18)	0.01	0.38*	(0.20)	0.07	
Panel I: Confidence in Stopping Poaching										
Confidence in gov't will to prevent poaching	0.17	(0.14)	0.24	0.21	(0.13)	0.13	0.19	(0.14)	0.20	
Confidence in gov't ability to prevent poaching	0.02	(0.10)	0.85	0.00	(0.17)	0.99	0.24	(0.20)	0.25	
Panel J: Disputes										
Number of disputed land plots	0.08	(0.31)	0.81	-0.27	(0.28)	0.35	-0.12	(0.51)	0.81	
Panel K: Security from Animal Attacks										
Lack of confidence in gov't ability to protect from attacks	-0.23	(0.25)	0.36	-0.31	(0.27)	0.27	-0.47	(0.31)	0.16	
Panel L: Other Villagers' Opinions on Conservation										
Others agree that conservation is more important than growth	0.50	(0.33)	0.15	0.48	(0.33)	0.17	0.87*	(0.41)	0.05	
Others agree that it is never okay to log	0.18	(0.14)	0.23	0.47**	(0.18)	0.02	0.70***	(0.23)	0.01	
Others agree that gov't should control land use	0.48**	(0.22)	0.05	0.51**	(0.22)	0.04	1.12***	(0.31)	0.00	
Others agree that gov't should prevent logging for profit	0.50***	(0.14)	0.00	0.68***	(0.19)	0.00	0.81***	(0.19)	0.00	
Panel M: Village Heads' Opinions on Conservation										
Importance of conservation to the world	0.00	(.)	.	0.00	(.)	.	0.00	(.)	.	
Importance of conservation to the local area	0.00	(.)	.	0.00	(.)	.	0.00	(.)	.	
Advocate nonviolent methods of controling animal problems	-0.53***	(0.15)	0.00	-0.41**	(0.17)	0.03	-0.49***	(0.15)	0.01	
Believe that conservation is a good use of local forest land	-0.17***	(0.01)	0.00	-0.21***	(0.02)	0.00	-0.15***	(0.04)	0.00	
Lack of reliance on forest products	-0.14*	(0.08)	0.09	-0.06	(0.10)	0.58	-0.07	(0.09)	0.47	
Disagree with proposals to use forest for economic growth	0.22	(0.15)	0.16	0.16	(0.13)	0.24	0.46**	(0.18)	0.02	
Desire to involve local land in such proposals	0.06	(0.11)	0.60	0.16*	(0.09)	0.09	0.28**	(0.11)	0.02	
Agree that conservation is more important than growth	0.15	(0.28)	0.59	-0.08	(0.30)	0.80	0.27	(0.34)	0.43	
Agree that it is never ok to log	-0.44**	(0.18)	0.03	-0.38**	(0.16)	0.04	-0.52**	(0.23)	0.04	
Agree that gov't should control land use	0.02	(0.18)	0.93	0.02	(0.16)	0.91	0.15	(0.28)	0.61	
Agree that gov't should prevent logging for profit	0.13	(0.17)	0.47	0.11	(0.17)	0.54	-0.15	(0.16)	0.38	
Panel N: Benefits from REDD										
Belief that REDD+ projects will not benefit village	-0.08	(0.11)	0.47	-0.07	(0.10)	0.52	-0.17	(0.12)	0.18	
Panel O: Benefits from Conservation										
Believe that forest use projects will not benefit household	0.07	(0.15)	0.62	0.30	(0.17)	0.10	0.43**	(0.19)	0.04	

* p<.10, ** p<.05, *** p<.01

Table 22. Environmental outcomes (comparing controls) - Environmental assessments

	COMPARISON OF ULU MASEN CONTROLS VS MATCHED LEUSER ViLLAGES									
	Model 1 (no controls)			Model 2 (key controls)			Model 3 (key controls + imbalanced			Desired
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	Direction
Panel A: Indices										
Logging	0.12	(0.17)	0.48	-0.09	(0.24)	0.72	-0.40	(0.29)	0.20	-
Mining	-0.37**	(0.14)	0.02	-0.44*	(0.22)	0.07	-0.48**	(0.20)	0.03	-
Poaching	-0.28	(0.21)	0.21	-0.47*	(0.25)	0.09	-0.67*	(0.34)	0.07	-
Animal Attacks	0.25	(0.22)	0.27	0.06	(0.29)	0.83	0.06	(0.38)	0.88	-
Forest Conversion	-0.23	(0.21)	0.28	-0.31	(0.27)	0.28	-0.57*	(0.29)	0.07	-
Panel B: Logging										
Reported # of sawmills	-0.05	(0.12)	0.67	-0.21	(0.14)	0.17	-0.41**	(0.15)	0.02	-
Reported # of chainsaws	-0.06	(0.69)	0.93	-1.61	(1.35)	0.25	0.16	(1.06)	0.88	-
Reported # of people involved in logging	-0.89	(1.48)	0.56	-4.21	(3.19)	0.21	-1.13	(2.38)	0.64	-
Observed # of sawmills	-0.13	(0.13)	0.34	-0.31*	(0.16)	0.07	-0.53***	(0.17)	0.01	-
Observed # of chainsaws	0.35	(0.31)	0.29	0.12	(0.33)	0.72	-0.36	(0.37)	0.35	-
Observed timber in village	0.97	(0.81)	0.25	0.61	(0.83)	0.48	-0.16	(0.89)	0.86	-
Observed logging sites in village	-0.04	(0.08)	0.60	-0.11	(0.12)	0.37	-0.19	(0.19)	0.32	-
Incidents of timber transport	0.11	(0.19)	0.57	0.11	(0.20)	0.57	-0.15	(0.24)	0.55	-
Panel C: Mining										
Reported # of people mining	-0.12***	(0.03)	0.00	-0.15**	(0.05)	0.01	-0.11**	(0.05)	0.05	-
Reported # of mining machines	-0.05***	(0.01)	0.00	-0.06***	(0.01)	0.00	-0.06**	(0.02)	0.02	-
Reported instances of mining	-0.02	(0.09)	0.83	-0.06	(0.09)	0.53	-0.20***	(0.06)	0.01	-
Observed # of grinding machines	-0.02***	(0.00)	0.00	-0.03**	(0.01)	0.04	-0.01	(0.01)	0.26	-
Observed # of metal excavations	-0.08*	(0.05)	0.10	-0.11**	(0.04)	0.02	-0.20**	(0.07)	0.01	-
Observed instances of mining	-0.07	(0.06)	0.29	-0.05	(0.08)	0.57	-0.09	(0.09)	0.33	-
Panel C: Poaching										
Reported index of poaching in village	-0.03	(0.02)	0.17	-0.03	(0.02)	0.13	-0.05**	(0.02)	0.04	-
Reported index of poaching outside village	-0.03	(0.03)	0.41	-0.06	(0.04)	0.13	-0.09	(0.05)	0.11	-
Reported index of hunting frequency	-0.03	(0.02)	0.21	-0.07*	(0.03)	0.05	-0.07	(0.04)	0.11	-
Panel D: Animal Attacks										
Reported index of animal attacks	-0.02	(0.03)	0.48	-0.06	(0.05)	0.30	-0.06	(0.07)	0.40	-
Observed evidence of animal attacks	0.22**	(0.09)	0.04	0.20**	(0.09)	0.05	0.21*	(0.11)	0.07	-
Panel E: Forest Conversion										
Reported amount of land converted (ha)	-1.99	(4.41)	0.66	-3.75	(6.41)	0.57	-2.65	(7.38)	0.73	-
Proportion of land converted w/o permission	-0.13*	(0.06)	0.07	-0.17**	(0.08)	0.04	-0.31***	(0.09)	0.01	-
Observed forest conversion (ha)	-0.84	(4.36)	0.85	-0.19	(7.03)	0.98	-4.83	(6.80)	0.49	-
Reported infrastructure/road development	-0.03	(0.04)	0.40	-0.10**	(0.04)	0.02	-0.15*	(0.07)	0.06	-
Observed infrastructure/road development	0.06	(0.10)	0.56	-0.01	(0.08)	0.93	-0.06	(0.09)	0.52	-
Panel F: Garbage										
Trash observed (highest possible score: 2)	0.29***	(0.04)	0.00	0.31***	(0.06)	0.00	0.33**	(0.11)	0.01	-

*p <.10, ** p<.05, *** p<.01

Table 23. Environmental outcomes (comparing controls) – HH heads survey

COMPARISON OF ULU MASEN CONTROLS VS MATCHED LEUSER VILLAGES

	Model 1 (no controls)			Model 2 (key controls)			Model 3 (key controls + imbalanced			Desired
	coef	*se*	*p-value*	*coef*	*se*	*p-value*	*coef*	*se*	*p-value*	**Direction**
Panel A: Indices										
Logging	-0.08	(0.08)	0.36	-0.09	(0.07)	0.24	-0.16**	(0.06)	0.02	-
Mining	-0.23	(0.14)	0.11	-0.20	(0.13)	0.15	-0.32	(0.35)	0.37	-
Community Awareness of Conservation	0.34***	(0.08)	0.00	0.30***	(0.08)	0.00	0.51***	(0.11)	0.00	+
Animal Attacks	0.27***	(0.08)	0.00	0.30***	(0.08)	0.00	0.44***	(0.07)	0.00	-
Picking Up Trash	-0.11	(0.08)	0.20	-0.11	(0.08)	0.19	-0.05	(0.10)	0.64	+
Conservation Institutions	-0.10	(0.11)	0.34	-0.10	(0.09)	0.30	-0.01	(0.11)	0.95	+
Confidence in Stopping Logging	0.39***	(0.11)	0.00	0.40***	(0.11)	0.00	0.22***	(0.07)	0.01	+
Confidence in Stopping Poaching	0.17	(0.10)	0.11	0.18**	(0.08)	0.04	0.19	(0.12)	0.13	+
Disputes	0.13*	(0.06)	0.06	0.12*	(0.06)	0.08	0.08	(0.06)	0.22	-
Security from Animal Attacks	0.16**	(0.07)	0.04	0.15**	(0.07)	0.05	0.03	(0.08)	0.71	-
Other Villagers' Opinions on Conservation	0.21***	(0.06)	0.00	0.18***	(0.06)	0.01	0.18	(0.12)	0.15	+
Household Heads' Own Opinions on Conservation	0.27***	(0.06)	0.00	0.25**	(0.09)	0.01	0.41***	(0.11)	0.00	+
Knowledge of Environmental Regulation	0.00	(0.06)	0.99	0.01	(0.06)	0.84	0.00	(0.10)	0.98	+
Benefits from REDD	0.25***	(0.08)	0.01	0.26***	(0.08)	0.01	0.36**	(0.15)	0.04	-
Benefits from Conservation	0.06	(0.08)	0.45	0.05	(0.08)	0.58	0.25	(0.17)	0.18	+
Logging										
Did loggers hire from HH in last 12 months?	-0.01	(0.03)	0.72	-0.01	(0.03)	0.79	-0.05*	(0.03)	0.06	-
Number of chainsaws in household	-0.04	(0.03)	0.18	-0.04	(0.03)	0.22	-0.03	(0.03)	0.24	-
Logging as income-generating activity	0.00	(0.01)	0.72	0.00	(0.01)	0.91	-0.01	(0.02)	0.72	-
Mining										
HH member has found gold near the village	-0.08	(0.05)	0.11	-0.07	(0.05)	0.15	-0.11	(0.12)	0.37	-
Community Awareness of Conservation										
Knows that there is protected forest nearby	0.14***	(0.03)	0.00	0.15***	(0.04)	0.00	0.36***	(0.07)	0.00	+
Knows that there is conservation forest nearby	0.06**	(0.03)	0.04	0.07**	(0.03)	0.02	0.05*	(0.03)	0.08	+
Knows that there is production forest nearby	0.18***	(0.05)	0.00	0.18***	(0.05)	0.00	0.17***	(0.05)	0.00	+
Knows that there is state-owned forest nearby	0.29***	(0.03)	0.00	0.31***	(0.04)	0.00	0.36***	(0.05)	0.00	+
Knows that there is community forest nearby	0.06	(0.04)	0.10	0.07*	(0.04)	0.08	-0.04	(0.04)	0.40	+
Knows not to hunt certain animals	0.22***	(0.03)	0.00	0.22***	(0.04)	0.00	0.29***	(0.06)	0.00	+
Knows which animals not to hunt	0.23***	(0.04)	0.00	0.23***	(0.04)	0.00	0.28***	(0.05)	0.00	+
Is logging a problem here?	-0.01	(0.01)	0.28	-0.02*	(0.01)	0.06	0.00	(0.02)	0.91	+
Is land clearing a problem here?	-0.04**	(0.02)	0.02	-0.05**	(0.02)	0.02	-0.01	(0.03)	0.82	+
Is water affected by mining/roads/construction?	-0.07***	(0.01)	0.00	-0.08***	(0.01)	0.00	-0.02	(0.02)	0.37	+
Non-response: logging hires in HH	0.00	(0.02)	0.98	-0.02	(0.02)	0.39	0.03	(0.03)	0.30	+
Non-response rate: daily payment for logging	-0.11*	(0.06)	0.09	-0.14**	(0.06)	0.03	-0.02	(0.09)	0.85	+
Non-response rate: daily payment for log transport	-0.14*	(0.07)	0.06	-0.18**	(0.07)	0.02	-0.06	(0.10)	0.60	+
Non-response rate: HH member finding gold	-0.04**	(0.02)	0.03	-0.04**	(0.02)	0.03	-0.01	(0.02)	0.55	+
Animal Attacks										
Elephant raid in last 12 months?	0.14***	(0.05)	0.01	0.15***	(0.05)	0.01	0.21***	(0.04)	0.00	-
Tiger attack HH members in last 12 months?	0.00	(0.00)	0.20	0.01	(0.00)	0.17	0.01**	(0.00)	0.04	-
Picking Up Trash										
Household contributed to trash collection	-0.05	(0.04)	0.20	-0.05	(0.04)	0.19	-0.02	(0.05)	0.64	+
Conservation Institutions										
Attend forest user group meetings	0.16**	(0.06)	0.01	0.16***	(0.05)	0.01	0.13**	(0.05)	0.02	+
Village had meetings to discuss forest land use	0.10***	(0.02)	0.00	0.10***	(0.02)	0.00	0.15***	(0.03)	0.00	+
Attended meetings to discuss forest land use	0.10***	(0.02)	0.00	0.11***	(0.02)	0.00	0.14***	(0.02)	0.00	+
Spoke at meetings to discuss forest land use	0.07***	(0.02)	0.00	0.08***	(0.02)	0.00	0.09***	(0.01)	0.00	+
HH participation in gotong royong	-1.35***	(0.14)	0.00	-1.34***	(0.17)	0.00	-1.44***	(0.25)	0.00	+
HH cleanup of forest/river in last 12 months	-0.05	(0.04)	0.20	-0.05	(0.04)	0.19	-0.02	(0.05)	0.64	+
HH practices crop rotation	0.04	(0.07)	0.54	0.05	(0.05)	0.41	0.12*	(0.06)	0.06	+
Confidence in Stopping Logging										
Confidence in gov't ability to prevent logging	0.35***	(0.07)	0.00	0.36***	(0.08)	0.00	0.24**	(0.08)	0.01	+
Confidence in gov't will to prevent logging	0.28**	(0.13)	0.05	0.29**	(0.11)	0.02	0.12**	(0.05)	0.04	+
Confidence in Stopping Poaching										
Confidence in gov't will to prevent poaching	0.18*	(0.09)	0.05	0.19***	(0.06)	0.01	0.12	(0.10)	0.25	+
Confidence in gov't ability to prevent poaching	0.08	(0.08)	0.31	0.08	(0.07)	0.26	0.17*	(0.09)	0.08	+
Disputes										
Engaged in land dispute	0.01*	(0.01)	0.06	0.01*	(0.01)	0.08	0.01	(0.01)	0.22	-
Security from Animal Attacks										
Lack of confidence in gov't ability to protect from attacks	0.15**	(0.06)	0.04	0.14**	(0.07)	0.05	0.03	(0.07)	0.71	-
Other Villagers' Opinions on Conservation										
Others agree that conservation is more important than growth	0.02	(0.12)	0.85	0.01	(0.12)	0.94	-0.01	(0.17)	0.97	+
Others agree that it is never okay to log	-0.03	(0.06)	0.61	-0.04	(0.05)	0.39	-0.25***	(0.08)	0.01	+
Others agree that gov't should control land use	0.36***	(0.08)	0.00	0.31***	(0.07)	0.00	0.40**	(0.15)	0.02	+
Others agree that gov't should prevent logging for profit	0.19	(0.11)	0.11	0.19*	(0.10)	0.08	0.30*	(0.15)	0.06	+
Household Heads' Own Opinions on Conservation										
Advocate nonviolent methods of controling animal problems	0.02	(0.06)	0.71	0.04	(0.06)	0.50	0.02	(0.06)	0.81	+
Importance of conservation to the world	0.09***	(0.01)	0.00	0.10***	(0.01)	0.00	0.15***	(0.04)	0.00	+
Importance of conservation to the local area	0.06**	(0.02)	0.02	0.06**	(0.02)	0.01	0.18***	(0.03)	0.00	+
Agree that conservation is more important than growth	-0.08	(0.16)	0.63	-0.11	(0.15)	0.50	-0.11	(0.18)	0.56	+
Agree that it is never ok to log	-0.08	(0.06)	0.23	-0.08	(0.06)	0.24	-0.28**	(0.10)	0.02	+
Agree that gov't should control land use	0.34***	(0.07)	0.00	0.32***	(0.04)	0.00	0.09	(0.08)	0.23	+
Agree that gov't should prevent logging for profit	0.20*	(0.11)	0.09	0.20*	(0.10)	0.07	0.19*	(0.10)	0.07	+
Believe that conservation is a good use of local forest land	-0.16*	(0.09)	0.08	-0.19*	(0.09)	0.06	-0.09	(0.16)	0.61	+
Lack of reliance on forest products	-0.02	(0.05)	0.74	-0.02	(0.05)	0.68	0.04	(0.16)	0.83	+
Disagree with proposals to use forest for economic growth	0.53***	(0.08)	0.00	0.50***	(0.09)	0.00	0.83***	(0.06)	0.00	+
Desire to involve local land in such proposals	0.38***	(0.05)	0.00	0.37***	(0.07)	0.00	0.64***	(0.08)	0.00	+
Knowledge of Environmental Regulation										
Did you learn anything about forest regulation during CRP?	-0.01	(0.01)	0.66	-0.01	(0.02)	0.56	0.03	(0.02)	0.18	+
Has heard of REDD+ program	0.01	(0.01)	0.65	0.02	(0.01)	0.23	-0.03	(0.03)	0.32	+
Benefits from REDD										
Belief that REDD+ projects will not benefit village	0.23***	(0.08)	0.01	0.24***	(0.08)	0.01	0.33**	(0.14)	0.04	-
Benefits from Conservation										
Believe that forest use projects will not benefit household	0.06	(0.08)	0.45	0.05	(0.08)	0.58	0.24	(0.17)	0.18	+

* p<.01, ** p<.05, *** p<.01

Annex 8

Technical Appendix on Estimating Effects

Village Effects

Effects using the village heads and environmental assessment data are based on contrasts across villages. Here we describe our methods for estimating effects from contrasts between villages assigned to treatment through the cluster (that is, mukim) level randomization, and then spillover effects by looking at contrasts between villages in the experimental control relative to those in the non-experimental control.

Experimental Treatment Effects

Consider village v in mukim m, where m is a mukim that was eligible to host the program. Assuming no spillover effects between villages, for village v in mukim m in blocking stratum b, we estimate village level effects by fitting the following model with weighted least squares,

$$Y_{bmv} = \beta_0 + \beta_1 T_{bm} + \sum_{j=1}^{B} \gamma_j 1(j = b) + X'_{bmv}\lambda + \eta_{bmv},$$

(1)

where $T_{bm} = 0,1$ is the treatment indicator for mukim m in blocking stratum b, β_1 is the village level treatment effect, the γ_j terms are blocking stratum fixed effects, X_{bmv} are covariates, and the error η_{bmv} is clustered at the level of mukims to coincide with the clustered treatment assignment. The regression weights are constructed as the inverse of the relevant treatment assignment probabilities:

$$w_{bm} = T_{bm}\left(\frac{V_b}{V_{1b}}\right) + (1 - T_{bm})\left(\frac{V_b}{V_b - V_{1b}}\right),$$

(2)

where V_b is the number of villages and V_{1b} the number of treated villages in blocking stratum b, respectively. The weighting accounts for the differential probabilities of treatment within the blocking strata, thereby recovering the distribution of mukims in the target population, which in this case is the set of 28 candidate mukims. Our primary estimates will exclude any covariates. Because of the relatively small sample size, we will incorporate covariates to try to boost power. The covariates are selected on the basis of their level of imbalance at baseline.

Non-Experimental Spillover Effects

The results in the previous section assumed no spillover effects between villages in the mukims that were eligible to host the program. We plan to use our non-experimental "pure" controls as a way to assess the credibility of this assumption. To do so we focus attention on the control group villages in Ulu Masen area, and estimate the "effect" of being an Ulu Masen control group village as compared to being a matched Leuser village. We fit the equivalent of equation (1), where the treatment variable takes the value 1 for villages in the Ulu Masen area and 0 for villages in the Leuser area. The Leuser villages assigned to the same blocking stratum as their matched Ulu Masen counterparts and assigned weights corresponding to the control group members in these blocking strata. Then, the effect estimated as β_1 tells us how the Ulu Masen control group villages from what we would expect given what we observe in the matched Leuser villages, where there was no programming that resembled the community rangers program. Of course, given the non-experimental nature of this comparison, we take it only as suggestive.

Household Effects

Effects using the household survey data are based on contrasts at the household level. As with the village level contrasts, these are based on the randomized mukim-level assignment of households to treatment or control status in the Ulu Masen area, and then the non-randomized but matched selection of communities in the Leuser area to test for spillover effects.

Experimental Treatment Effects

Our analysis of household level effects is based on the same regression specification as (1) except that we have household level data instead of village level data:

$$Y_{bmvh} = \beta_0 + \beta_1 T_{bm} + \sum_{j=1}^{B} \gamma_j 1(j = b) + X'_{bmv}\lambda + \eta_{bmvh},$$

(3)

where h indexes households and all other terms are defined as in expression (1). Another difference with respect to the village level analysis comes in the way that we define weights. We randomly selected a fixed number of households per village for interview (specifically, 10 households per village), but villages vary in their number of households. Denote the number of households in village v as H_v. Then, households are expansion weighted by $H_v/10$ to recover the full set of households in the village. That being the case, we fit the regression in expression (3) by weighted least squares, where the household level weights are given by

$$w_{bmh} = \frac{H_v}{10} w_{bm}.$$

Non-Experimental Spillover Effects

As with the village level analysis, we study whether inter-mukim spillover effects might taint our experimental analysis by examining differences between control households in the Ulu Masen area and households in the Leuser area, where no programs were administered. Households in a given area in Leuser are assigned to the same blocking stratum as the households in the areas to which they were matched in Ulu Masen. The weights for the households in Leuser are defined analogously as was done for the Ulu Masen villages---that is, by taking the product of the household sampling rate within the village ($H_v/10$) with the block-specific weight (w_{bm}), where v indexes the Leuser-area village in which the household resides, and b indexes the blocking stratum corresponding to the Ulu Masen stratum to which the village is matched. The estimates for the spillover effects are obtained by fitting a model analogous to expression (3) using data from control group households in Ulu Masen and Leuser households, where the treatment variable takes the value 1 for households in the Ulu Masen area and 0 for those in the Leuser area. The coefficient on this redefined treatment variable (equivalent to β_1 in expression (3)) estimates the "effect" of being in the Ulu Masen area as opposed to the Leuser area.

Youth Effects

Experimental Treatment Effects

We estimate effects on youth survey data by fitting models of the following form:

$$Y_{mvi} = \alpha_0 + \alpha_1 Z_{mvi} + \sum_{j=1}^{M} \zeta_j 1(j = m) + X'_{mvi}\theta + \epsilon_{mvi},$$

(4)

where i indexes individuals, v villages, and m mukims, Z_{mvi}=0,1 is the individual level treatment variable, the ζ_js are mukim level fixed effects to account for the blocking by mukim, the X_{mvi} are covariates, and ϵ_{mvi} is an individual level error assumed to be heteroskedastic but independent across units (corresponding to the individual level treatment assignment). The coefficient α_1 estimates the effect of interest. We fit the model using weighted least squares. As discussed above, individual level treatment assignment was based on a restricted randomization procedure such that probabilities varied at the village level on the basis of the number of candidates available from each village within the CRP mukims. We are able to reproduce the exact assignment probability for each individual—denote it as ϕ_{mvi}. Then, the design-based weight that recovers the full distribution of youth within the CRP mukim is given by

$$w_{mvi} = Z_{mvi}\frac{1}{\phi_{mvi}} + (1 - Z_{mvi})\frac{1}{1 - \phi_{mvi}}.$$

To minimize the bias related to attrition, we apply an inverse probability weighting approach. Specifically we use the full set of baseline covariates to estimate the probability of endline response, which we denote as $\pi(X_{mvi})$. The observed data are then expansion weighted by $1/\pi(X_{mvi})$ to recover the full distribution of candidate rangers. As such, the regression weight that we apply to our youth data equals $w_{mvi}/\pi(X_{mvi})$.

Our baseline specification in Section **Error! Reference source not found.** excludes any covariates, while our efficiency-enhanced specification incorporates baseline covariates for key demographic variables and to correct for chance imbalances between the treatment and control groups as described in the next section.

Non-experimental Spillover Effects

The non-experimental youth controls include youth from villages in non-CRP mukims in the Ulu Masen area as well from the Leuser area. To test for the possibility of spillover effects, we fit a model to data from only non-treated youth using the following specification:

$$Y_{bmvi} = \pi_0 + \pi_1 UC_{bm} + \pi_2 LC_{bm} + \sum_{j=1}^{B} \gamma_j 1(j = b) + X'_{bmvi}\lambda + \eta_{bmvi},$$

(5)

where UC_{bm} is an indicator variable for being in an Ulu Masen control mukim, LC_{bm} is an indicator variable for being in a Leuser control mukim, and the other terms are defined analogously as in expression (3). The coefficients π_1 and π_2 tell us how we would have to adjust the outcomes of control youth in the Ulu Masen CRP mukims to account for within-Ulu Masen and Ulu Masen-wide spillover effects, respectively.

To provide as compelling a test as possible, we reweight youth from the non-CRP Ulu Masen and Leuser mukim so as to reconstruct as closely as possible the covariate profile of the pool of candidate rangers in the Ulu Masen CRP mukim. These balancing weights are constructed within each of the blocking strata (recall that each Leuser area inherits the blocking stratum corresponding to the mukim to which it was matched). The appropriate weights are "odds weights" that take the following form:

$$\rho_{bi} = \frac{\tilde{\pi}(X_{bi})}{1 - \tilde{\pi}(X_{bi})},$$

where $\tilde{\pi}(X_{bi})$ is the probability of being a candidate youth in an Ulu Masen CRP mukim in block b conditional on available covariates. We use the "entropy balancing" function in Stata 13 to compute these probabilities and construct the weights.[4]

Missing Data

As is common with survey data, items that we use in the analysis sometimes exhibited missing values, whether because of non-response, enumerator error, or data entry error. We checked all variables and noted that in all cases rates of missingness were quite low (below 5%). Nonetheless, because even with low rates of missingness, if the missingness is scattered across variables, one may have to drop substantial numbers of observations in multivariate analyses (e.g., regressions or analyses that use indices constructed from multiple items). To avoid that, we imputed missing values using chained-regressions with predictive mean matching; the imputation was done in Stata using the "ice" package.[5] We only used a single round of imputation; given the low rate of missingness, this should have negligible consequences for bias and measures of uncertainty (including, standard errors and associated hypothesis tests).

[4] Hainmueller, J. 2011. Entropy balancing for causal effects: a multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis 20*(1): 25-46.

[5] Royston P. 2004. Multiple imputation of missing values. *Stata Journal 4*(3):227-241; Royston P. 2007. Multiple imputation of missing values: further update of ice, with an emphasis on interval censoring. *Stata Journal 7*: 445-464.