

Power calculations – TANZANIA

Our key assumptions are informed by two RCTs conducted in Kenya (see Habyarimana and Jack (2011, 2015)). In particular, we make the following assumptions about the data generating process and desired tolerance for type I and II errors.

Key assumptions:

1. Although buses are either organized by routes, ownership and/or administration, we don't believe that there is a cluster structure to the underlying data generating process predicting accidents. This is particularly true in Tanzania where larger administrative bodies such as the Tanzania bus owners association (TABOA) play a larger role in the day to day management of buses.
2. Given the challenges of identifying high quality predictive data (as well as prior tests of lagged measures of accident incidence), we assume that there are no reliable covariates that predict the incidence of accidents.
3. Finally, non-compliance to the intervention has significant effects on the required sample size to precisely estimate any given program impacts. Accordingly, we modify our baseline power calculations based on compliance levels observed during recruitment and over time in Tanzania.
4. Finally, we use standard power calculation design parameters as follows: Power – 80%; confidence level 95%.

Given the absence of a grouped structure and predictive covariates, we use STATA's **sampsi** command to generate the sample size requirements.

We use data collected from police stations across regions in Tanzania to estimate accident rates in the control group. Given the 3000 buses we have recruited so far, the annual total number of accidents between 2013 and 2015 ranges between 244 and 372 for an average of 288 accidents per year. This corresponds to a range in annual accident rates of 8.3% to 12.4% and an average just under 10%. In Table 1 below we show the sample size requirements for the lower and upper limits of this range as well as the average over the last three years. The first row shows the baseline sample size per study arm required, while the second row shows the adjustment for non-compliance.

Based on data on compliance during recruitment as well as monitoring data from the sticker lottery, we observe higher compliance than we did in the first RCT study in Kenya.¹ Overall compliance including accepting and retaining at least one sticker is 92%. Non-compliance in the control group is just under 1%.

We demonstrate the power calculations for reductions in annual accident rates of the order: 50%, 33.3% and 20%.

Table 1: Power Calculations for Tanzania

Reduction in annual accident rate	50%	33%	20%
	Panel A: N=244		
Baseline sample size per study arm	592	1453	4113
Adjusting for non-compliance $1/(0.92-0.01)^2$	714	1755	4967

¹ In Habyarimana and Jack (2011) we observe a compliance rate of 83% in the vehicles offered stickers and a non-compliance rate of 16% in vehicles not assigned to the receive stickers.

Reduction in annual accident rate	50%	33%	20%
	Panel B: N = 288		
Baseline sample size per study arm	495	1189	3464
Adjusting for non-compliance $1/(0.92-0.01)^2$	598	1436	4183
	Panel C: N = 372		
Baseline sample size per study arm	375	914	2610
Adjusting for non-compliance $1/(0.92-0.01)^2$	453	1104	3152

The cells shaded in grey suggest that we are powered to precisely estimate reductions in accident rates of the order of 50% under all baseline accident scenarios and 33% for the average and high point of the accident distribution.

In all accident rate scenarios, we are not powered to observe small reductions on the order of 20% of baseline accident rates.²

² Assuming a similar baseline levels of accidents, we will be powered to observe smaller changes in Uganda if we can recruit 6000 vehicles.