

Appendix 3: Randomization Algorithm:

Following is the executable R code that we will use to conduct the randomization. This code ensures that that the two level III NICU clusters are assigned to different steps. It also ensures that every step has at least one rural cluster. It proceeds by determining the number of each type of cluster in each step, and then randomly assigns the clusters to steps accordingly.

```
#### Create a list with steps

steps <- vector(3,mode="list")
names(steps) <- c("Step_1","Step_2","Step_3")

#### Randomly sample number of Level_III and rural clusters in each step

df_ns <- data.frame(n_level_III=sample(c(0,1,1),3,replace=FALSE),
                   n_rural = sample(c(1,1,2),3,replace=FALSE))

#### Determine the number of urban clusters such that total number
#### of clusters per step is 4

df_ns <- within(df_ns,{
  n_urban <- 4-(n_level_III+n_rural)
})

#### Randomly assign the Level_III sites

III_sites <- c("level_III_site_1","level_III_site_2")

for(i in 1:3){
  #### need to ensure the loop can handle the step with no level III NICU
  #### The following is for steps assigned to have a level III NICU
  if(df_ns$n_level_III[i]==1){
    #### Identify vector index for level III site for step i
    idx <- sample.int(length(III_sites),df_ns$n_level_III[i])
    steps[[i]]$level_III <- III_sites[idx]
    #### Remove the sampled level III site from the vector of
    #### sites to be assigned
    III_sites <- III_sites[-idx]
  } else {
    #### for step with no level III NICU, assign empty character
    steps[[i]]$level_III <- character(0)
  }
}

#### Randomly assign the rural units

rural_sites <- c("rural_site_1","rural_site_2","rural_site_3","rural_site_4")
```

```

for(i in 1:3){
  idx <- sample.int(length(rural_sites),df_ns$n_rural[i])
  steps[[i]]$rural_sites <- rural_sites[idx]
  rural_sites <- rural_sites[-idx]
}

### Randomly assign urban sites

urban_sites <- c("urban_site_1","urban_site_2","urban_site_3",
                "urban_site_4","urban_site_5","urban_site_6")

for(i in 1:3){
  idx <- sample.int(length(urban_sites),df_ns$n_urban[i])
  steps[[i]]$urban_sites <- urban_sites[idx]
  urban_sites <- urban_sites[-idx]
}

### Assemble assignments into a data frame

step_assignments <- as.data.frame(t(sapply(steps,unlist)))
names(step_assignments) <- c("Cluster_1","Cluster_2","Cluster_3","Cluster_4")
step_assignments

```