Estimate Dark Rate of Crime

Set Basic Values

Clear Environment

```
rm(list = ls())
```

Load Packages

```
library(psych)
library(kableExtra)
library(drcr)
```

Set Seed for Reproducibility

```
set.seed(123)
```

Set Basic Values

```
n <- 1e+05
decs <- 4
```

Create Simulation Data

```
parm_sim0 <- set_parms()
parm_sim <- parm_sim0[3:length(parm_sim0)]
data0 <- sim_data(n, parm_sim0)
data <- data0[, 1:4]
```

Estimate Parameters

```
params0 <- set_inits()
# result <- wrap_optim(data, params0, LF)
result <- wrap_optim(data, params0, LF, grad = LF_gradient)
```

```
## initial  value 0.777562
## iter  10 value 0.662612
## iter  20 value 0.662543
## iter  30 value 0.662426
## iter  40 value 0.662415
## iter  50 value 0.662412
## iter  60 value 0.662410
## iter  70 value 0.662410
## iter  80 value 0.662410
## iter  90 value 0.662410
## iter 100 value 0.662410
## iter 110 value 0.662410
## final  value 0.662410
## converged
```

Show Results

```
result_table <- get_results(data, result)
sim.values <- c(parm_sim, E_hat = mean(data0[, "E"]), C_hat = mean(data0[, "C"]))
result_table <- cbind(sim.values, result_table)
kable(result_table)
```

	sim.values	estimates	SE	ci.lower	ci.upper
c	0.40000	0.4551	0.0539	0.3495	0.5606
phi	0.30000	0.2952	0.0175	0.2608	0.3296
eta	-0.20000	-0.2648	0.0397	-0.3427	-0.1869
d	0.50000	0.4619	0.0467	0.3704	0.5534
xi	0.40000	0.3684	0.0355	0.2988	0.4379
alpha	0.20000	0.2917	0.0477	0.1982	0.3851
E_hat	0.82958	0.8248	0.0750	0.6779	0.9319
C_hat	0.72050	0.7257	0.0806	0.5754	0.8521

Estimate Dark Rate:

DRC = 1 - R/C

```
DRC <- get_dark_rate(mean(data[, "R"]), result_table["C_hat", ]$estimates)
cat("DRC: ", DRC, "\n")
```

```
## DRC:  0.1773185
```

Show Summary Statistics

```
kable(describe(data))
```

	vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
Z	1	1e+05	0.99934	0.7065016	1	0.9991750	0	0	2	2	0.0009310	-0.9965924	0.0022342
W	2	1e+05	0.99956	0.7066716	1	0.9994500	0	0	2	2	0.0006211	-0.9975562	0.0022347
R_prev	3	1e+05	0.49799	0.4999985	0	0.4974875	0	0	1	1	0.0080399	-1.9999554	0.0015811
R	4	1e+05	0.59702	0.4904993	1	0.6212750	0	0	1	1	-0.3955930	-1.8435246	0.0015511

Show Correlation Table

```
kable(cor(data))
```

	Z	W	R_prev	R
Z	1.0000000	-0.0037261	-0.0022118	0.1138241
W	-0.0037261	1.0000000	0.0077523	0.0952710
R_prev	-0.0022118	0.0077523	1.0000000	-0.0185120
R	0.1138241	0.0952710	-0.0185120	1.0000000