

# Optimizing Makeham

```
# Load used libraries
library(readr)
library(tidyverse)
library(knitr)
source("../..//scripts/00_method.R")

# Read in the merged dataset for 2011
dataset = read_csv("../..//data/01_processed/2011_qx_data.csv") %>%
  filter(between(Age, 35, 95)) %>%
  # Remove Iceland as its too much of an outlier
  filter(
    !(Country %in% c("ISL"))
  )
# Read in the optimized makeham data
Stage1_model <- read_rds("../..//data/02_models/stage1.rds")
Stage2_model <- read_rds("../..//data/02_models/stage2.rds")

# Compute zero-makeham for comparison
stage1_zero_make = dataset %>% mutate(lambda_makeham = 0) %>% compute_stage1
stage2_zero_make = stage1_zero_make %>% compute_stage2

kable(list(
  stage1_zero_make %>% compute_table1,
  Stage1_model %>% compute_table1
))
```

Gender	Country Name	lnh	l_m	g	m	b
Female	Australia	-11.549	0	10.30%	90.052	9.707
Female	Austria	-11.849	0	10.86%	88.645	9.206
Female	Belarus	-10.110	0	9.36%	82.719	10.685
Female	Belgium	-11.332	0	10.24%	88.375	9.761
Female	Canada	-11.364	0	10.14%	89.539	9.867
Female	Croatia	-11.764	0	11.22%	85.331	8.910
Female	Czechia	-11.616	0	10.95%	85.882	9.132
Female	Denmark	-11.584	0	10.72%	87.201	9.325
Female	Estonia	-10.896	0	9.91%	86.614	10.089
Female	Finland	-11.653	0	10.59%	88.872	9.447
Female	France	-11.156	0	9.68%	91.087	10.326
Female	Germany	-11.642	0	10.68%	88.085	9.365
Female	Greece	-11.919	0	10.94%	88.749	9.144
Female	Hungary	-10.799	0	10.12%	84.047	9.878
Female	Ireland	-11.552	0	10.54%	88.263	9.489
Female	Israel	-11.852	0	10.84%	88.817	9.223
Female	Italy	-12.009	0	10.90%	89.843	9.175
Female	Japan	-11.314	0	9.73%	92.321	10.275
Female	Korea	-11.806	0	10.65%	89.848	9.392
Female	Latvia	-10.455	0	9.62%	84.340	10.395
Female	Lithuania	-10.235	0	9.24%	85.022	10.827
Female	Luxembourg	-11.849	0	10.89%	88.471	9.186
Female	Netherlands	-11.444	0	10.41%	88.174	9.603
Female	New Zealand	-11.370	0	10.30%	88.358	9.713
Female	Norway	-11.877	0	10.89%	88.671	9.179
Female	Poland	-11.131	0	10.27%	86.248	9.740
Female	Portugal	-11.592	0	10.50%	88.952	9.526
Female	Russia	-9.770	0	8.95%	82.214	11.176
Female	Slovakia	-11.407	0	10.81%	84.962	9.254
Female	Slovenia	-11.660	0	10.70%	88.063	9.344
Female	Spain	-11.855	0	10.60%	90.637	9.430
Female	Sweden	-12.059	0	11.11%	88.778	9.003
Female	Switzerland	-12.049	0	10.92%	90.066	9.158
Female	Taiwan	-11.225	0	10.13%	88.237	9.875
Female	U.K.	-11.258	0	10.15%	88.372	9.851
Female	U.S.A.	-10.504	0	9.28%	87.556	10.774
Female	Ukraine	-10.179	0	9.54%	82.053	10.479
Male	Australia	-10.824	0	9.91%	85.863	10.086
Male	Austria	-10.757	0	10.06%	84.066	9.936
Male	Belarus	-7.738	0	7.11%	71.648	14.063
Male	Belgium	-10.592	0	9.89%	83.668	10.106
Male	Canada	-10.782	0	9.90%	85.554	10.101
Male	Croatia	-10.148	0	9.74%	80.275	10.266
Male	Czechia	-10.250	0	9.80%	80.873	10.202
Male	Denmark	-10.677	0	10.05%	83.368	9.949
Male	Estonia	-9.040	0	8.33%	78.708	12.009
Male	Finland	-10.267	0	9.51%	83.239	10.519
Male	France	-10.070	0	9.06%	84.624	11.034
Male	Germany	-10.719	0	10.08%	83.557	9.918
Male	Greece	-10.342	0	9.49%	84.130	10.533
Male	Hungary	-9.415	0	8.97%	78.055	11.144
Male	Ireland	-10.797	0	10.06%	84.522	9.944
Male	Israel	-11.023	0	10.17%	85.877	9.828
Male	Italy	-11.271	0	10.59%	85.213	9.441
Male	Japan	-10.754	0	9.90%	85.281	10.103
Male	Korea	-10.435	0	9.74%	83.253	10.271
Male	Latvia	-8.514	0	7.86%	75.971	12.724
Male	Lithuania	-8.142	0	7.22%	75.232	12.324