Sex, age, and smartphone addiction across 41 countries

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Abstract

Most studies of problematic smartphone use focus on younger participants in a single country, which makes global comparisons difficult. Here, we administered the Smartphone Addiction Scale (Short Version) to $50,423$ participants aged 18 to 90 from 195 countries and subdivisions. The results showed that women scored 3.22 units higher than men, each year of age predicted a decrease of 0.18 units, and global scores increased by 0.66 units per year. Among the 41 countries with at least 100 participants, almost all showed a consistent pattern: women scored higher than men ($B = -0.19$ to 6.07) and there was a downward slope with age ($B = -0.38$ to -0.03), though the shape of the slope varied across countries. The highest problematic smartphone use scores were around Southeast Asia and the lowest were in Europe. This global sample, currently the largest in the field, helps clarify the relationships between sex, age, and smartphone use.

Keywords: problematic smartphone use, smartphone addiction, demographics, diversity, global

1 Introduction

Although there have been thousands of studies on problematic smartphone use, broad international comparisons remain scarce (Kalaitzaki et al., 2022). Studies tend to rely on convenience samples of local students and neglect older populations (Busch & McCarthy, 2021; Horwood et al., 2021) despite their different patterns of smartphone use (Andone et al., 2016; Busch et al., 2021; Nahas et al., 2018). Given limited sample sizes, these studies often combine ages into bins which can obscure nuanced patterns. The studies that do capture broad demographics are difficult to compare given the variety of different scales and criteria used to assess problematic use (Abendroth et al., 2020; Davidson et al., 2020; Gutiérrez et al., 2016; Harris et al., 2020). Even meta-analyses that focus on a single measure are limited by the varying methodologies of the included studies (e.g., Olson, Sandra, Colucci, et al., 2022).

These issues are only partly resolved by global datasets that estimate screen time or smartphone ownership rates by country (GlobalWebIndex, 2018; Newzoo, 2021; Pew Research Center, 2019). Inferring global *problematic smartphone use* — how smartphones may negatively affect one's life — is difficult given that measures such as screen time or smartphone pickups explain under 20% of the variation in problematic use (Parry et al., 2021; Shaw et al., 2020). The effects of smartphones are personal and often subjective; some people may use their smartphones to connect with distant family and experience benefits while others passively scroll through social media and feel depressed (cf. Ryding & Kuss, 2020; Sohn et al., 2021). These personal effects can vary across the lifespan as well: for example, a German study found that smartphone use during the COVID-19 pandemic predicted more loneliness in younger adults (aged 18 to 29) yet less loneliness in older adults (55 to 78) (Wetzel et al., 2021). Another study from Italy found that *nomophobia*, the fear or anxiety caused by lacking one's smartphone, was highest in younger women (aged 15 to 44) and older men (45 to 67). Understanding how problematic smartphone use varies by age, sex, and their interaction is important when developing tailored interventions to reduce it (Olson, Sandra, Chmoulevitch, et al., 2022).

The current study attempts to address several gaps in the literature related to demographics. Namely, are gender differences in problematic smartphone use consistent across countries (Kalaitzaki et al., 2022; van Deursen et al., 2015)? Does problematic smartphone use have a linear or non-linear relationship with age? How quickly is it increasing across the world? Here, we present a global survey to answer these questions.

2 Methods

2.1 Participants

We recruited 50,423 self-selected participants after they completed a creativity study online (Olson et al., 2021).[1] Participants learned about the study from news websites, social media, or word of mouth. Our sample included only participants aged 18 to 90 who completed all measures and came from unique IP addresses. Most of the participants were women (64%) and the average age was 39.67 (*SD* = 15.37, range: 18 to 90). They came from a total of 195 countries and subdivisions, most commonly the United States (57%), Canada (6%), and Britain (6%). There were 41 countries with at least 100 participants (see Table S2).

2.2 Procedure

After giving informed consent, participants completed the short version of the Smartphone Addiction Scale (SAS-SV) (Kwon et al., 2013), which recently emerged as the top-cited measure in the field (Olson, Sandra, Colucci, et al., 2022). The scale captures various facets relevant to behavioural addictions (Sohn et al., 2019) and assesses people's perceptions of how compulsive patterns of smartphone use interfere with their lives. We made small modifications to the scale for clarity (cf. Olson et al., 2020). The scale has 10 items, such as: "I have a hard time concentrating in class, while doing assignments, or while working, due to smartphone use". Participants rate their agreement with each item from 1 (strongly disagree) to 6 (strongly agree) for a total score between 10 and 60; internal consistency was good (Cronbach's $\alpha = .82$). Higher scores predict clinical judgements of addiction (Kwon et al., 2013), though researchers continue to debate whether

[1] One third of the sample was analysed to test an unrelated hypothesis (cf. Study 3 in Olson, Sandra, Langer, et al., 2022).

problematic smartphone use constitutes a behavioural addiction (Panova & Carbonell, 2018). The scale did not meet the criteria for measurement invariance (Putnick & Bornstein, 2016), suggesting that it may have been interpreted somewhat differently across countries.

Participants completed basic demographic measures (age, sex, and country) before seeing their overall problematic smartphone use score. This brief 3-min procedure enabled broad data collection, which took place between July 2021 and August 2023. The protocol was approved by the McGill University Research Ethics Board II (#451-0518).

2.3 Analysis

We used mixed-effect modelling to predict individual problematic smartphone use given age, sex, their interaction, and time (i.e., the number of months since starting data collection). Each country had a random intercept in the model to account for regional differences. Because statistical power approached 100%, we focus on effect sizes and confidence intervals rather than hypothesis tests (still, all ps $< .001$). All statistical assumptions were reasonable. Square brackets throughout denote 95% confidence intervals.

We additionally tested for correlations between problematic smartphone use and two country-level variables: daily mobile internet screentime (GlobalWebIndex, 2018; Statistica, 2022) and *cultural tightness–looseness*, the strictness of social norms (Uz, 2015), which has been linked to smartphone use (Olson, Sandra, Colucci, et al., 2022). Because the demographics within each country varied, we used the linear-predicted average across sexes at age 25, which was the most common in our sample. To improve the precision of our estimates, all country-level analyses used only the 41 countries with at least 100 participants.

3 Results and discussion

3.1 Problematic smartphone use

Participants had an average SAS-SV score of 27.61 (SD = 9.28). Based on the suggested cut-off scores from 31 to 33 (García-Manglano et al., 2021; Kwon et al., 2013), between 29% and 31% of the sample would be considered at a high risk of addiction. Similar prevalence rates have

been found in samples under 25 years old (14 to 31%, Sohn et al., 2019) and in a global survey of problematic smartphone use in adults with an average age of 26 (28%, Kalaitzaki et al., 2022). Our country-level predicted scores were on average 3.21 units higher than the estimates from our recent meta-analysis (Olson, Sandra, Colucci, et al., 2022), which may reflect the increased technology use during the COVID-19 pandemic due to trends in remote work and schooling (Trott et al., 2022). Still, there was a strong correlation in country-level scores between both studies ($r\,(14) = .71$ $[.34, .89]$). Overall, the highest scoring item on the scale was "I use my smartphone longer than I intend" ($M = 4.41$, SD = 1.46), with an average response between "weakly agree" and "agree".

3.2 Age

Problematic smartphone use was highest in younger participants (Figure 1), with an estimated drop of 0.18 units per year when controlling for the other predictors (Table S1). This negative slope was consistent across countries, ranging from -0.38 in the Philippines to -0.03 in Indonesia. The interaction between age and sex was small ($B = -0.03$); both men and women tended to show similar downward slopes overall.

The shape of the age-related decline, however, varied by country. In Australia, scores remained fairly stable until around age 40, after which they declined; this pattern was also seen in a representative sample from the same country (Horwood et al., 2021). Hungary, in contrast, showed a peak in young adulthood followed by a slower decline, consistent with another study (Csibi et al., 2019). In the United States and Canada, both men and women showed a linear decline in problematic smartphone use with age. Several countries such as Brazil and Japan appeared to show atypical patterns such as increases within some age groups, but more research is needed to determine whether these are artifacts of the non-representative samples in these countries.

3.3 Sex

Women in our sample had higher problematic smartphone use (M = 28.16, SD = 9.26) than men (M = 26.62, SD = 9.23), with a difference of 3.22 units when controlling for the other predictors. This difference had a consistent direction across almost all countries with at least 100

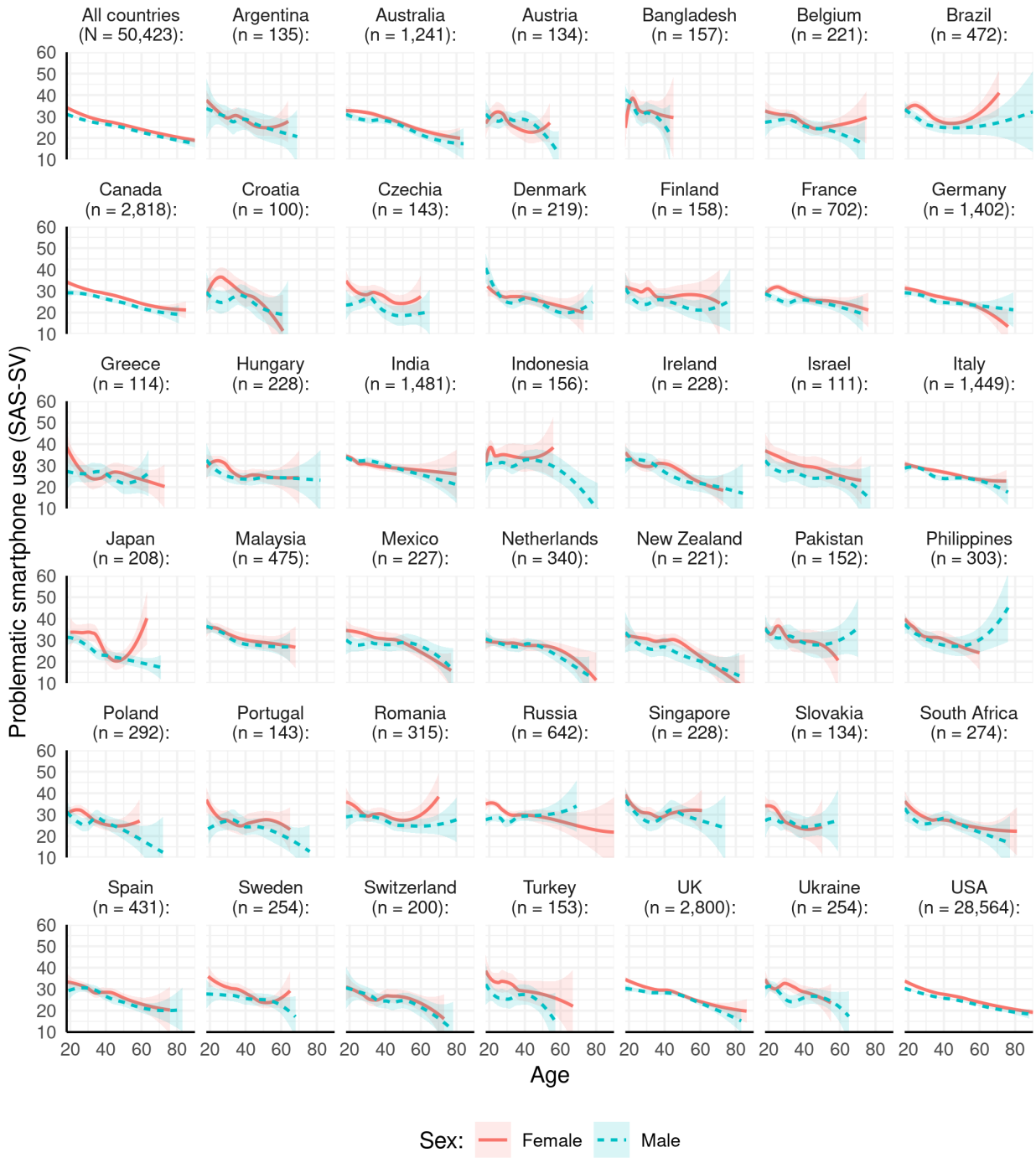

Figure 1

Problematic smartphone use (SAS-SV) by age and sex across countries with at least 100 participants. Lines show smoothed averages and bands show 95% confidence intervals.

participants, ranging from 6.07 (women higher) in Turkey to −0.19 (men higher) in Austria. Previous studies have found similar sex differences in problematic smartphone use (Andone et al., 2016; Kwon et al., 2013). One reason for this difference is that women tend to use their phones for more social purposes which can promote habitual behaviour (van Deursen et al., 2015). Additionally, women generally have higher rates of depression and anxiety; scales of problematic smartphone use may inadvertently capture distress and coping mechanisms (Davidson et al., 2020; Elhai et al., 2017; Melumad & Pham, 2020).

3.4 Time

Global problematic smartphone use scores increased by 0.66 units per year when controlling for the other predictors. This estimate is about half of that from a meta-analysis of problematic smartphone use in a younger sample (aged 15 to 35) between 2014 and 2020 (1.4 units per year, Olson, Sandra, Colucci, et al., 2022). Given these increasing scores, researchers should be cautious when applying and interpreting the decade-old clinical cut-offs initially proposed for the Smartphone Addiction Scale (García-Manglano et al., 2021; Kwon et al., 2013). Future clinical cut-offs could account for the year of data collection as excessive smartphone use becomes more normative across the world.

3.5 Country

Europe had the lowest problematic smartphone use scores (Czechia: 27.66, Switzerland: 27.88, and Portugal: 28.07), consistent with recent cross-cultural surveys and meta-analyses (Kalaitzaki et al., 2022; Olson, Sandra, Colucci, et al., 2022). The highest scores were around Southeast Asia (Philippines: 34.47, Malaysia: 34.05, and Bangladesh: 33.69) (Figure 2; Table S2). The explanation for these regional differences is unclear, but we can speculate that the stricter and more established social norms in countries such as the Philippines (Uz, 2015) may lead to frequent smartphone use in order to keep in closer contact with friends and family. In contrast, some European countries with more individualistic and loose norms may have less of this motivation. There was accordingly a negative correlation between cultural looseness and predicted problematic smartphone use ($r\,(32) = -.48\ [-.71, -.18]$), confirming the results of our previous meta-analysis

($r = -.56$, Olson, Sandra, Colucci, et al., 2022).

Estimates of country-level mobile internet time (Statistica, 2022) also correlated with our predicted averages of problematic smartphone use ($r\,(29) = .63\ [.36, .81]$), as in the previous meta-analysis (Olson, Sandra, Colucci, et al., 2022). Measures such as screen time estimates may be more useful to explain problematic smartphone use on the country level than the individual level (cf. Shaw et al., 2020).

3.6 Strengths, limitations, and future directions

Our study extends previous meta-analytic findings. Meta-analyses are generally limited by the diverse characteristics of their included studies, such as their varying populations, sampling procedures, exclusion criteria, and study contexts. Here, we hold most of these factors constant by recruiting within a single study. Most of our findings confirm those of previous meta-analyses and surveys (Kalaitzaki et al., 2022; Olson, Sandra, Colucci, et al., 2022), but we were able to study more countries and quantify the increase in global problematic smartphone use given our 25 months of data collection.

The main limitation of our study was that the sample was self-selected and thus not representative. Those volunteering to complete creativity or smartphone studies online may not best represent the overall population. Further, the relatively small sample sizes in some countries (e.g., in Japan; Figure 1) made it difficult to draw conclusions about the linearity of age-related changes. Still, our observed scores may be sufficiently reliable for an approximate global comparison given that our country-level averages strongly correlated with those of previous studies (Olson, Sandra, Colucci, et al., 2022) and with country-level screen time estimates (Statistica, 2022).

Future studies could use similarly diverse samples to quantify the effectiveness of interventions. Nudge- or app-based interventions (e.g., Grüning et al., 2023; Okeke et al., 2018) could be tested across countries to see if their compliance and effectiveness rates vary by demographics. Such findings could improve the targeting or personalisation of interventions across

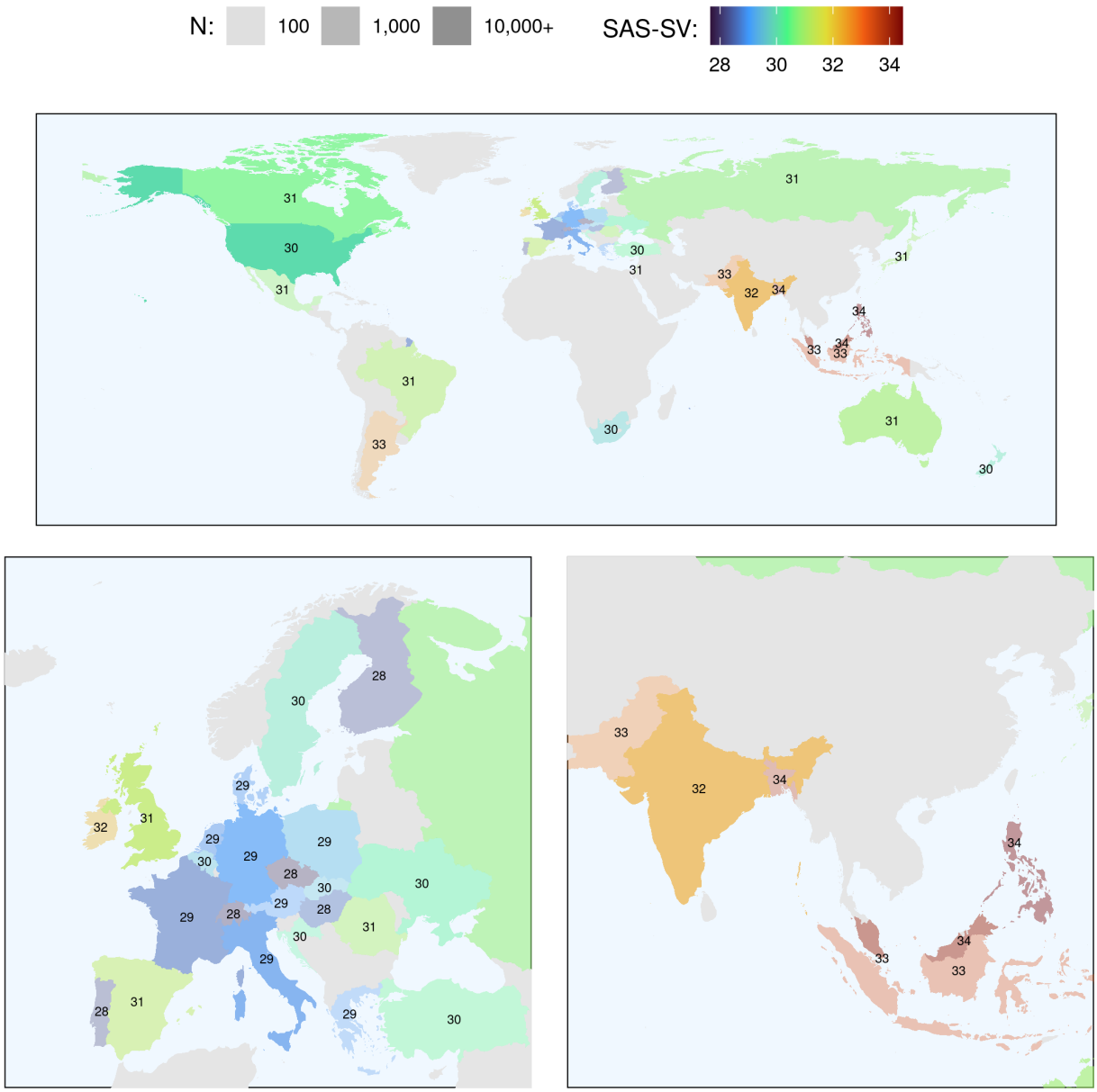

Figure 2

Problematic smartphone use (SAS-SV) was lowest in Europe and highest around Southeast Asia. The scale ranges from 10 to 60, with higher scores indicating more problematic use. Map shows linear-predicted averages across sexes at age 25 in countries with $N \geq 100$. Brighter colours indicate higher sample sizes. For individual country averages, see Table S2.

cultures. Large and long-term samples could also be used to understand how global events such as pandemics influence smartphone use, or to predict which demographic segments are likely to experience the sharpest increases and benefit from preventive interventions.

3.7 Conclusion

This global study of problematic smartphone use, currently the largest in the field, offers a more nuanced view of the potential effects of demographic variables. Some patterns were almost always consistent across countries: women scored higher than men, and younger participants tended to score higher than older ones. However, the size of these sex differences, the slopes of the age-related declines, and their linearity or non-linearity tended to vary. We hope that these results will be useful to researchers looking to make comparisons across broad demographics or to those researching smartphone use in under-studied countries.

Data transparency

The dataset is available online at https://osf.io/ek6vb/.

4 Informed consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.

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Appendix

Supplementary online material

Table S1 shows regression results and Table S2 shows scores across countries.

Table S1

Regression results. All variables predicted problematic smartphone use. The country-level grouping explained 4% of the variance.

Predictor	*B*	*95% CI*	*SE*	β
(Intercept)	33.50	32.98, 34.03	0.27	−0.08
Age	−0.18	−0.19, −0.17	0.00	−0.29
Sex (female)	3.22	2.78, 3.66	0.22	0.22
Time in months	0.05	0.04, 0.07	0.01	0.04
Age × sex	−0.03	−0.04, −0.02	0.01	−0.05

Table S2

Average problematic smartphone use (SAS-SV) scores by country. Only countries with at least 100 data points are shown; see Data transparency section for full dataset. $\hat{M}_{25}$ shows the linear predicted value across sexes at age 25. Slopes (B) and proportion of variance explained (R^2) are for models containing only age and sex as predictors. Note that there were non-linear relationships in some countries (see Figure 1).

Country	$\hat{M}_{25}$	*N*	B_{age}	B_{sex}	R^2
Philippines	34.47	303	−0.38	2.08	.16
Malaysia	34.05	475	−0.27	1.44	.09
Bangladesh	33.69	157	−0.34	0.58	.04
Indonesia	33.35	156	−0.03	4.40	.08
Pakistan	32.82	152	−0.18	1.23	.04
Singapore	32.78	228	−0.20	2.28	.07
Argentina	32.62	135	−0.31	0.85	.15
India	32.38	1,481	−0.18	−0.17	.03
Ireland	32.23	228	−0.29	1.31	.16
United Kingdom	31.26	2,800	−0.19	1.70	.07
Spain	31.24	431	−0.25	1.28	.12

Country	$\hat{M}_{25}$	N	B_{age}	B_{sex}	R^2
Israel	31.14	111	−0.18	4.84	.13
Brazil	31.10	472	−0.23	3.87	.10
Romania	31.07	315	−0.18	2.32	.06
Japan	31.03	208	−0.35	3.56	.21
Australia	30.96	1,241	−0.20	2.30	.08
Mexico	30.91	227	−0.10	3.57	.06
Russia	30.81	642	−0.16	4.94	.10
Canada	30.56	2,818	−0.20	2.63	.10
Turkey	30.47	153	−0.20	6.07	.11
Croatia	30.29	100	−0.20	5.41	.15
Ukraine	30.26	254	−0.18	2.36	.06
New Zealand	30.05	221	−0.21	3.87	.11
Sweden	30.04	254	−0.21	2.62	.09
United States	29.97	28,564	−0.20	2.02	.08
South Africa	29.74	274	−0.19	1.72	.06
Slovakia	29.54	134	−0.27	2.34	.11
Belgium	29.54	221	−0.17	2.15	.06
Poland	29.40	292	−0.22	2.09	.07
Germany	28.96	1,402	−0.18	1.95	.06
Austria	28.91	134	−0.24	−0.19	.08
Greece	28.90	114	−0.22	2.24	.08
Denmark	28.90	219	−0.21	1.22	.09
Italy	28.87	1,449	−0.18	1.04	.07
Netherlands	28.84	340	−0.08	0.34	.01
France	28.57	702	−0.12	3.52	.06
Hungary	28.50	228	−0.18	3.01	.08
Finland	28.18	158	−0.11	4.73	.10
Portugal	28.07	143	−0.12	3.53	.06
Switzerland	27.88	200	−0.12	0.95	.03
Czech Republic	27.66	143	−0.19	5.45	.16