

Bilateral average intelligence increase through tourism

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The old joke goes “tourist from New Zealand visited Australia, and raised the average I.Q.s of both countries.” This piece of anti-Australian propaganda must be quantified in these days of heightened border security concerns. This paper establishes the expected number of such tourists to arrive in Australia per year.

Suppose that the intelligence of both Australians and New Zealanders follows a normal distribution for each individual with mean μ and variance σ^2 . Then the average intelligence for Australia (I_A) and New Zealand (I_{NZ}) will both follow a normal distribution with mean μ and variance σ^2/p_A and σ^2/p_{NZ} respectively, where p_A is the population of Australia and p_{NZ} is the population of New Zealand. The average mental superiority $S = I_{NZ} - I_A$ of New Zealanders over Australians¹ will then be distributed normally with mean 0 and variance $\sigma^2\lambda^2$ where λ^2 is $1/p_A + 1/p_{NZ}$.

Suppose that a random tourist T with I.Q. I_T from New Zealand to Australia also has the same I.Q. distribution². Assume further that this is independent of S , which is close to true assuming that the populations are large so that no individual has a significant impact. In order for T to fulfil the conditions of the joke, we need $I_A < I_T < I_{NZ}$. If we assume again that I_A and I_{NZ} are both very close to μ compared to σ (which is the same as saying $\lambda \ll 1$), then the probability density function for I_T will be pretty close to constant $1/\sigma\sqrt{2\pi}$ in the region I_A to I_{NZ} . Integrating this between I_A and I_{NZ} gives $S/\sigma\sqrt{2\pi}$, assuming $S > 0$. The probability P_T that T fulfils the conditions of the joke then becomes the expectation of this probability over the distribution of S :

$$P_T = \int_0^\infty \frac{s}{\sigma\sqrt{2\pi}} \frac{1}{\sigma\lambda\sqrt{2\pi}} e^{-s^2/2\lambda^2\sigma^2} ds = \frac{\lambda}{2\pi} \int_0^\infty x e^{-x^2/2} dx = \frac{\lambda}{2\pi}.$$

If the number of visitors to Australia from New Zealand each year is N_V , then the expected number making the joke true each year is $N_V P_T$, or

$$\frac{N_V}{2\pi} \sqrt{\frac{1}{p_A} + \frac{1}{p_{NZ}}}.$$

We now put concrete numbers behind this. For the year ending 31 Jan 2006, $N_V = 1,104,600$ ³. At the end of 2005, $p_A = 20,352,013$ ⁴, and $p_{NZ} = 4,100,600$ ⁵. These give an expected number of New Zealand visitors to Australia each year causing an affront to national pride of 95.16. It is not clear what the government is doing about this.

¹This of course may be negative.

²This may not be true as tourists to Australia may not be unbiased with respect to I.Q., however it is likely that a reasonable portion of them occupy the critical I.Q. close to μ point.

³Tourism Australia, Visitors by country of residence, http://www.tourism.australia.com/content/Research/visitordata/Jan06_abs_arrivals.pdf

⁴Australian Bureau of Statistics, cat. no. 3222.0 Population Projections, Australia, 2004–2101, Table 1. Projected population, Components of change and summary statistics—Australia(a).

⁵Statistics New Zealand, Population indicators, <http://www.stats.govt.nz/tables/population-indicators.htm>