Average IQ of the Brightest Kid in School

John R. Berryhill

Abstract

The individual IQ score is regarded as an indicator of general intelligence and a predictor of future educational attainment. What, on average, would be the highest IQ found in a typical American high school? This question is addressed by means of a Monte Carlo simulation under reasonable assumptions. The answer is a number in the neighborhood of 150.

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When tests of intelligence are administered to a large population, the resulting scores are found to approximate a Gaussian distribution. Once the results are calibrated so that he mean is 100 and the standard deviation is 15, the scores are called IQ. IQ is regarded as a proxy for general intelligence.[1]

The nature of the Gaussian or *normal* distribution is that 96% of IQ scores lie between 70 and 130, i.e., within two standard deviations of the average for the population. Only 2% of IQs are found in the zone above 130. In a population of 4000 students, say, we expect to find about 80 IQs higher than 130.

Fig. 1 shows a histogram of 4000 randomly generated Gaussian deviates, using a bin size of 0.5 s.d. (standard deviation.) A secondary scale at the top of the graph expresses the results in terms of IQ. We find that the region greater than 2 s.d. contains 82 instances, and that none of these is greater than 4 s.d. (IQ = 160.) Of course, the next group of 4000 random instances will differ somewhat in the details of the long, skinny tail of the distribution.

I take 2000 students as a typical size for an American high school. My interest is in how the *high* scores are distributed. More specifically, what is the *maximum* score actually found in each population of 2000 students?

I addressed this question by means of a Monte Carlo simulation. I generated 1000 sets of 2000 normally distributed random deviates (method of Ref. 2) and scaled these as IQ scores. Within each group of 2000, I determined the single highest score. Then I analyzed the distribution of these highest scores.

Fig. 2 shows a histogram of the maximum value found in each of 1000 sets of 2000 randomly generated Gaussian deviates. (Bin size is 0.25 s.d.) There was no instance lower than IQ 141, and the distribution is distinctly peaked around IQ 150. The highest IQ found in the total two million instances was 172. The distribution in Fig.2 is unsymmetrical. Its mean is 3.44 s.d. and its median is 3.40 s.d. These values correspond to an average IQ of 151.

If we take a smaller size for the high school under consideration, we get a different result. Fig. 3 shows a histogram based on the same two million pseudo-random numbers, but accumulated this time into 2000 groups of 1000 instances. The minimum IQ encountered is 136; the mean (3.245 s.d.) and median (3.201 s.d.) correspond to IQ 148. This outcome reflects the fact that a smaller group has a reduced chance of including a scarce example.

I leave it to the reader whether these results seem consistent with the reader's experience.

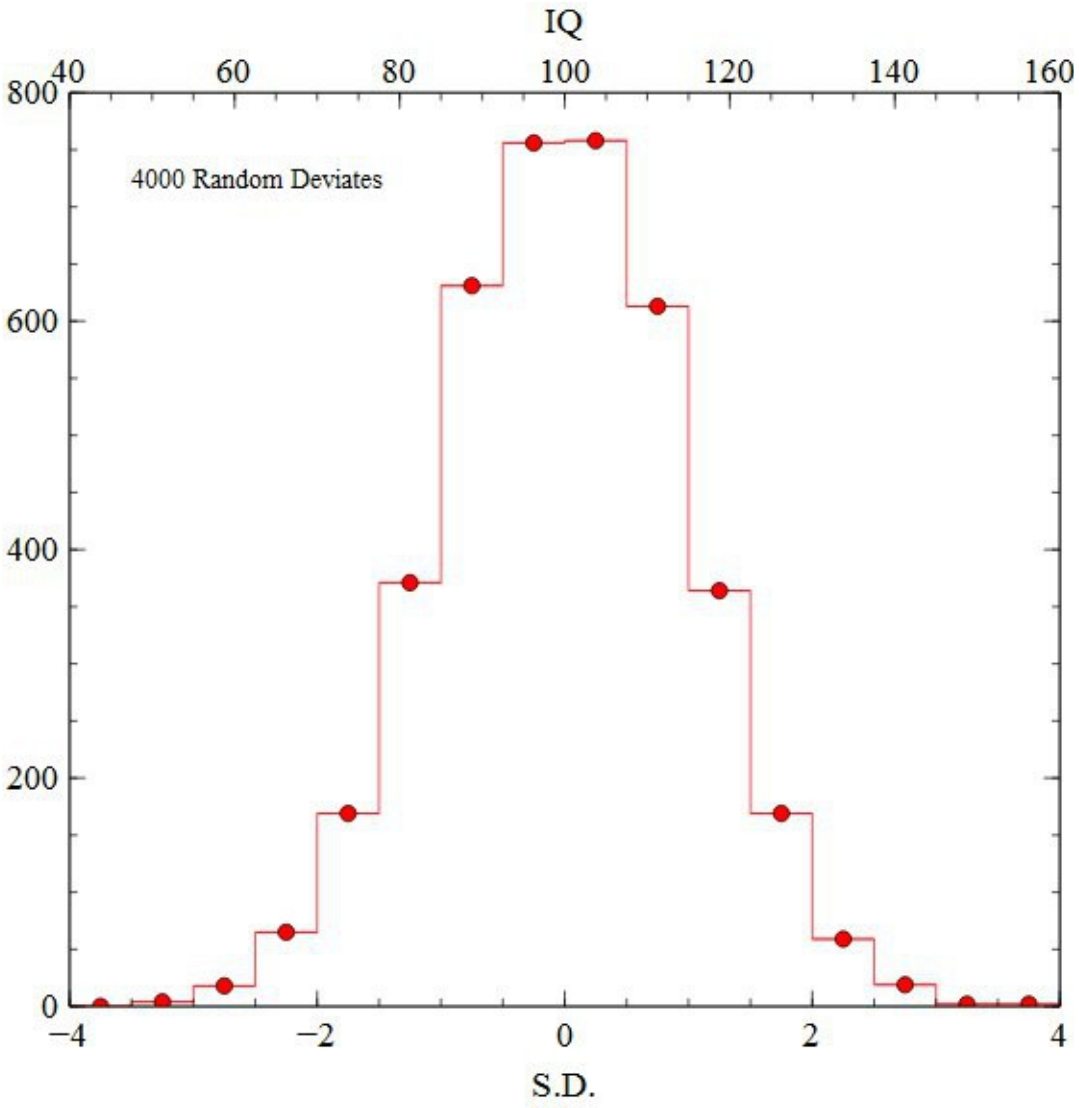

Fig. 1 The distribution of 4000 randomly generated IQ scores, representing the population as a whole.

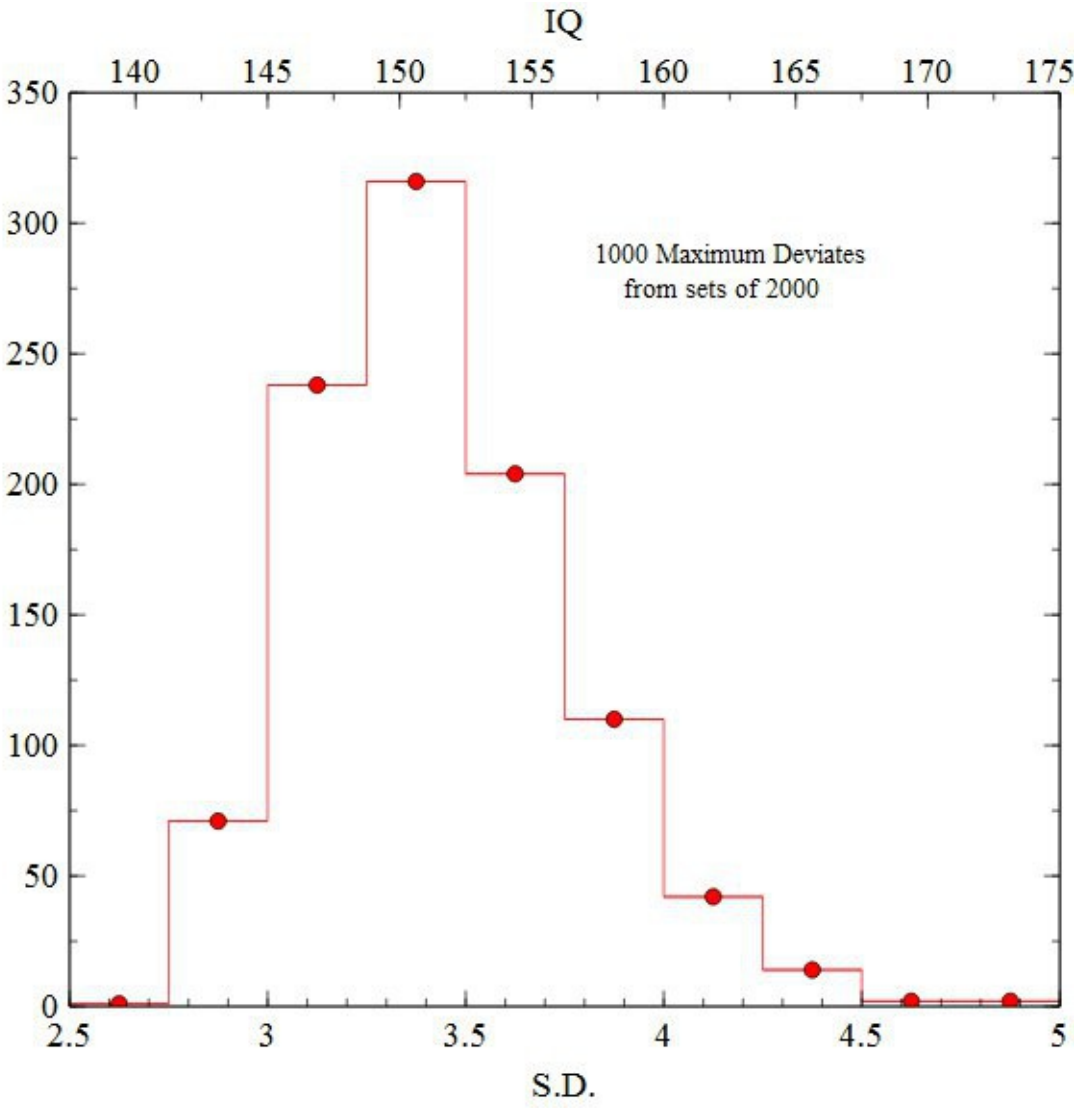

Fig.2 The distribution of the highest individual scores encountered in groups of 2000 individuals.

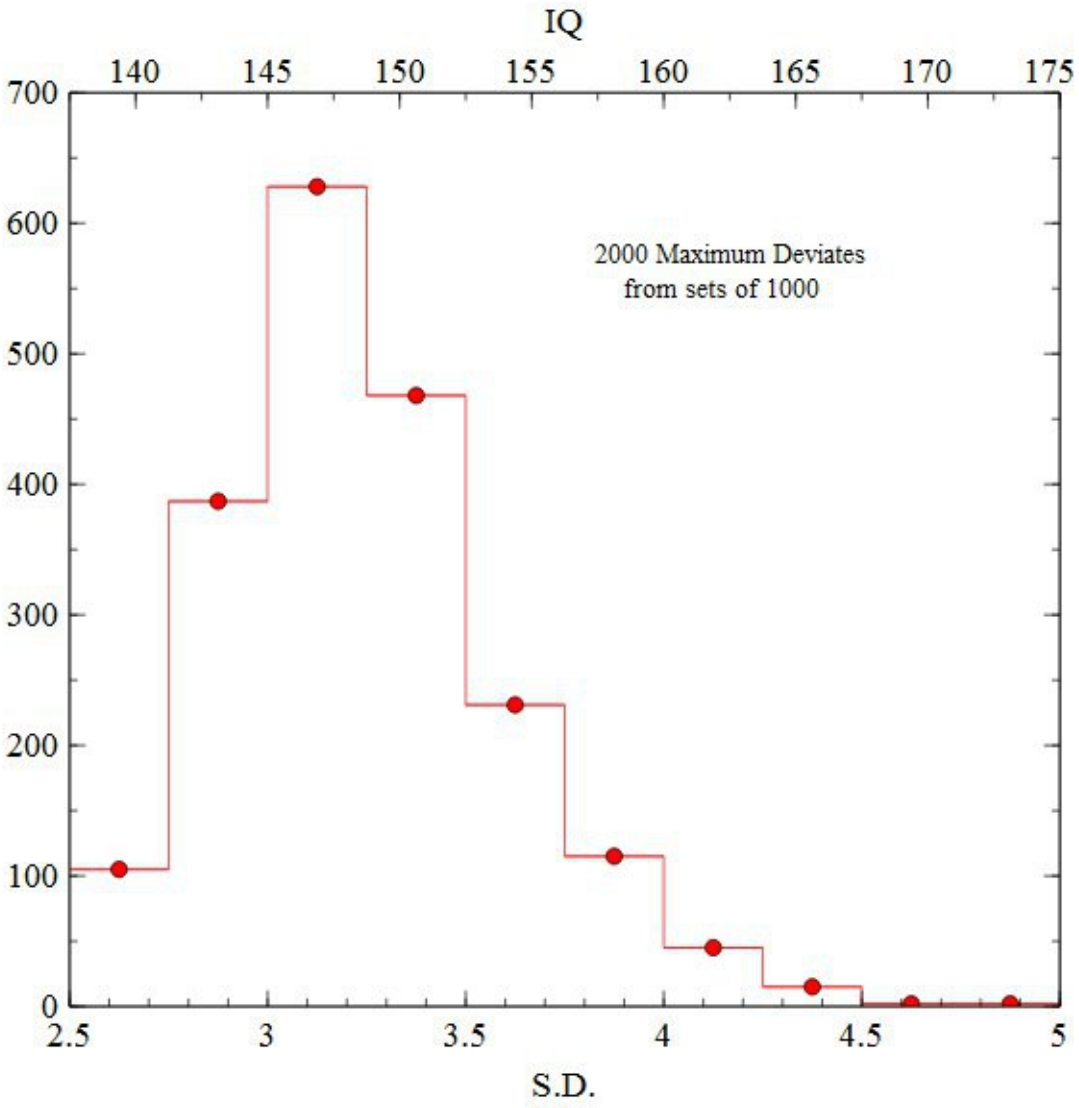

Fig. 3 The distribution of the highest individual scores encountered in groups of 1000 individuals.

References

1. Richard Lynn & Tau Vanhanen, *IQ and Global Inequality,* Washington Summit Publishers (2006), Chapter 2.

2 William H. Press, Saul A. Teukolsky, William T. Vetterling, Brian P. Flannery, *Numerical Recipes in C*, Cambridge University Press (1992), “Normal (Gaussian) Deviates,” p.288.

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