

## Introduction

### Prerequisites

#### [Percentiles](#)

In 1969 the war in Vietnam was at its height. An agency called the *Selective Service* was charged with finding a fair procedure to determine which young men would be conscripted ("drafted") into the U.S. military. The procedure was supposed to be fair in the sense of not favoring any culturally or economically defined subgroup of American men. It was decided that choosing "draftees" solely on the basis of a person's birth date would be fair. A birthday lottery was thus devised. Pieces of paper representing the 366 days of the year (including February 29) were placed in plastic capsules, poured into a rotating drum, and then selected one at a time. The lower the draft number, the sooner the person would be drafted. Men with high enough numbers were not drafted at all.

[New York Times article about bias in the lottery](#)

[Article about the draft itself](#)

[Raw Data](#)

Table 1 shows the order in which birth dates were drawn from the drum (from left to right). The first number selected was 258, which meant that someone born on the 258th day of the year (September 14th) got a draft number of "1" and was among the first to be drafted. The second number was 115, so someone born on the 115th day (April 24th) got a draft number of "2." All 366 birth dates were assigned draft numbers in this way. Someone born on the 160th day of the year (the last draft number drawn) got a draft number of 366.

Table 1. The birth dates emerging from the 1970 draft lottery in order of appearance.

258	115	365	45	292	250	300	251	327	341	244	342	190	102	
194	364	15	270	306	156	223	178	206	279	50	349	203	157	62
91	145	92	77	307	128	237	132	304	346	124	345	195	344	229
215	316	332	221	247	189	312	25	357	218	137	340	54	19	24
173	242	112	264	179	131	317	207	43	165	356	254	286	169	
118	140	311	28	362	305	314	95	249	94	360	159	32	280	210
46	109	38	26	183	302	359	351	313	199	334	366	5	228	151
171	343	222	321	61	175	158	214	138	259	219	185	236	296	
23	267	198	16	67	363	104	276	318	319	353	336	136	320	330

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133 163 355 71 177 287 66 18 231 225 322 33 217 323 98
107 269 42 273 44 204 230 127 326 338 255 2 266 246 358
348 30 339 76 241 220 75 86 289 205 361 335 257 299 263
135 56 167 39 328 141 252 325 21 202 187 48 200 120 294
213 9 268 298 130 227 8 79 297 278 324 265 58 162 260
121 182 35 31 47 68 36 4 41 90 101 100 284 12 180 88 6
245 150 201 154 303 329 105 248 271 281 17 55 285 14 80
354 293 256 295 277 239 262 174 193 153 142 3 114 97 290
261 83 272 84 73 108 216 119 253 301 82 309 63 87 96 211
93 164 106 168 64 125 191 139 186 20 333 315 282 192 60
238 212 291 209 53 234 49 65 288 134 148 34 123 59 72
155 51 208 352 1 7 226 149 331 310 232 99 152 347 274
113 69 13 144 350 129 197 70 224 10 143 188 337 11 122
196 78 243 81 161 110 22 40 235 117 170 283 85 233 111
103 37 308 29 184 116 240 181 74 27 166 147 176 275 172
146 89 52 126 57 160

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The intention was for every birth date to have the same chance of coming up first as coming up second, or third, etc. Was this reasonable expectation met, or were some times of year more likely to get lower numbers than others? Look at Table 1 and see if you can discern the answer to this question. You'll see that staring at the numbers in the table provides little idea of the overall pattern, and thus does not help to decide whether the birth dates were drawn randomly.

Things are much clearer if we graph the relation between birth dates and draft number. There are many ways of creating such a graph. Let's proceed as follows. First, we'll divide the 366 birth dates into thirds (122 days each). The first third goes from January 1 to May 1, the second from May 2 to August 31, and the last from September 1 to December 31. The three groups of birth dates yield three groups of draft numbers. The draft number for each birthday is the order it was picked in the drawing.

[View the three sets of 122 draft numbers.](#)

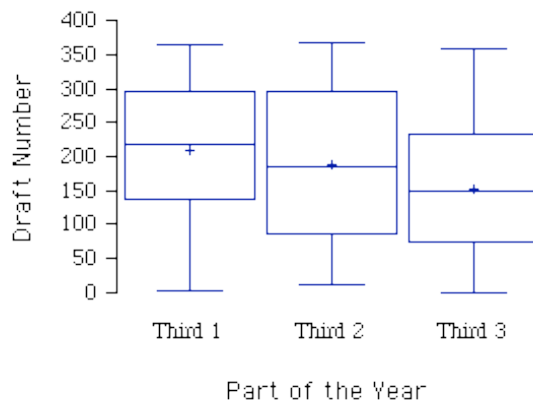
Next, from each group of draft numbers we'll pick six numbers to summarize all 122 of them. Specifically, in each group, we determine:

1. The minimum draft number of the group
2. The draft number at the 25th percentile of the group
3. The draft number at the 50th percentile of the group
4. The draft number at the 75th percentile of the group

5. The maximum draft number of the group
6. The mean of the 122 draft numbers

Each set of 6 numbers (one such set for each group of birthdays) is then used to draw a box along a vertical scale running from 1 to 400. (We go beyond 366 just to stop at a nice, round number.) The bottom of the box is drawn at the draft number corresponding to the 25th percentile. The top is drawn at the draft number corresponding to the 75th percentile. The draft number corresponding to the 50th percentile is drawn as a line inside the box. Lines outside of the box mark the minimum and maximum draft numbers. Finally, a plus sign is used to mark the mean. The three boxes are then set side-by-side starting with the earlier birth dates and finishing with the latest. This procedure gives us the three boxes shown in Figure 1. For example, we see from the first box that the 25th percentile of the first group is the draft number 122 whereas the 75th percentile is 298. The 50th percentile of the first group is 217, the mean is 210, and the minimum and maximum draft numbers are 2 and 365.

Figure 1. Draft numbers as a function of the part of the year the person was born.



If the draft numbers had been chosen randomly, then the three boxes should have been about the same. However, they differ systematically. The later in the year someone was born, the lower their draft number was likely to have been. In other words, the box representing those born in the first third of the year is higher than the box representing those born in the second third which is, in turn, higher than the box for those born in the last third. Had there been no

relationship between birth date and draft number, the three boxes in Figure 1 would be lined up horizontally. Apparently the plastic capsules holding the birth dates were not shuffled sufficiently by the rotating drum. The last ones put in tended to be the first ones pulled out. (Which boys went to war was thus partly determined by a premature decision to stop turning the drum.)

The important point is that Figure 1 brings order to a confusing array of data. Specifically, it makes clear the relationship between birth date and draft number. Although not everyone born late in the year was assigned a low draft number, draft numbers did decrease systematically with birth date. This relation is not easy to detect from the numbers in Table 1 but the visual representation in Figure 1 makes the relationship easy to see.

Choosing what to graph and how to graph it is often the most important part of a statistical analysis. Even sophisticated statistical analyses are often less revealing than a well-constructed graph.