

RANDOM SELECTION POSSIBILITIES

We have received a number of calls recently from program managers around the country regarding random selections. They state that some employees who are being randomly selected are raising concerns that they are being “singled out” and are being subjected to testing more often than their fellow employees. These employees often point out that some of their fellow coworkers haven’t been randomly selected in over a year. Sometimes we even hear of an employee who claims, “I’ve been picked every quarter.” While a check of our records indicates that this is not the case, it is understandable why an employee who has been selected three out of five quarters would think this. Well, what are the “real” probabilities of being randomly selected once, twice or more, or not at all, in a given year? We’ll answer these questions in this latest edition of the FirstLab Report.

Since most of our clients are conducting random drug testing four times a year at an annual rate of 50%, let’s base our calculations with that as a given. Let’s also assume there are exactly 200 employees in the random testing pool.

First, what are the chances of an employee; let’s call him Bob, being selected in any one of the four quarters? Well, since there are 200 employees and we are testing at an annual rate of 50%, 100 random tests will be conducted during the year, 25 each quarter. Bob could be among the 25 selected each quarter, so his chances are 25/200 or 1 in 8 (12.5%) of being selected in any given quarter. (If you’re lost already, there is no sense in reading on, go back to “go”).

Now that we know that Bob has a 12.5% chance of being selected in any given quarter, what’s his chance of not being selected in any given quarter? This is simple: 100% minus 12.5% = 87.5% or $8/8 - 1/8 = 7/8$. So, Bob’s chance of not being selected in any given quarter is 87.5%.

Next, what is his chance of not being selected all year (four quarters)? Well, this is pretty straightforward. If his chance of not being selected in any one quarter is 87.5% or $7/8$, his chance of not being selected all year would be:

$$7/8 \times 7/8 \times 7/8 \times 7/8 = 2401/4096 = 58.6\%$$

So, if Bob has a 58.6% chance of not being selected at all during the year, what is the chance that he will be selected at least once? Again, this is pretty straightforward: 100% - 58.6% = 41.4%. So, even though Bob’s company is testing at 50% a year, we’ve just seen that his chance of actually being tested is not 1 out of 2 as most of us would believe. In fact, Bob has a greater chance of not being selected than being selected.

Now, here's where it gets tougher. What is the chance that Bob will be selected exactly once during the year? Because he can be selected once in any one of the four quarters, we can graphically represent it like so:

Yes, No, No, No, or;
 No, Yes, No, No, or;
 No, No, Yes, No or;
 No, No, No, Yes.

The "yes's" indicate that if he is tested exactly once, he can be chosen in the first, second, third or fourth quarter. So, if we turn these into fractions where 1/8 = yes, 7/8 = no, we have:

$$\begin{aligned} (1/8) \times (7/8) \times (7/8) \times (7/8) + & 8.374 + \\ (7/8) \times (1/8) \times (7/8) \times (7/8) + \text{OR} & 8.374 + \\ (7/8) \times (7/8) \times (1/8) \times (7/8) + & 8.374 + \\ (7/8) \times (7/8) \times (7/8) \times (1/8) & 8.374 = 33.5\% \end{aligned}$$

So, the probability that Bob will be selected exactly once is 33.5% (hang in there, we're almost done!).

Finally, if Bob has a 58.6% chance of not being selected at all during the year and a 33.5% chance of being selected exactly once, what is the probability of him being selected more than once? By subtracting these two numbers from 100% we get: 100% - 58.6% - 33.5% = 7.9%. Bob has almost an 8% chance of being selected more than once in a given year. If we translate this percentage to the total population, (200 x 7.9% = 15.8), you can see that, in fact, a total of 16 employees will probably suffer this same fate.

Let's summarize. Given a 50% annual testing rate, selecting at four times a year the probability of:

- being selected in any given quarter = 12.5%
- not being selected in any given quarter = 87.5%
- not being selected in a year = 58.6%
- being selected at least once in a year = 41.4%
- being selected exactly once in a year = 33.5%
- being selected more than once in a year = 7.9%

Keep in mind; these percentages are not affected by how many employees are in the pool. Also, if you select at a higher or lower rate or more often than four times a year all of these percentages will change. For example, if you are randomly testing for drugs or alcohol at a 25% annual rate four times a year, the above percentages would change. Without going into the detailed calculations again, the new probabilities would look like this:

- being selected in any given quarter = 6.25%
- not being selected in any given quarter = 93.75%
- not being selected in a year = 77.25%
- being selected at least once in a year = 22.75%
- being selected exactly once in a year = 20.60%
- being selected more than once in a year = 2.15%

FOR FURTHER INFORMATION ON THIS SERVICE, CONTACT FIRSTLAB'S BUSINESS DEVELOPMENT DEPARTMENT AT 800-732-3784 OR MKT@FIRSTLAB.COM