Understanding outmigration in the Six-Year Dogwood Completion Rate

The Dogwood Completion Rate is adjusted for outmigration – namely, those students who leave British Columbia. (They may successfully complete school elsewhere, but the Ministry of Education has no way of knowing this when it takes place outside B.C.)

As a proxy, the Ministry calculates the outmigration rate for students in Grades 2 through 4 in a particular district. This rate is then applied to the *actual cohort* to obtain the estimated number in the cohort who outmigrated.

How outmigration is estimated

Outmigration is estimated using a *likelihood of migration*, or "propensity to outmigrate." This is a measurement of the likelihood that a student (1) will leave B.C. after entering a cohort AND (2) will be out of B.C. in the last year of that cohort.

The Ministry of Education cannot state with certainty which students actually *outmigrated* (left the province), as opposed to dropping out. Instead, the Ministry must use an estimate based on a proxy group of students in Grades 2 through 4. These students – who are in the same district and present in the same school year as the students in the actual cohort – provide a reasonably sound basis for estimating actual outmigration because primary students cannot drop out.[1]

Students have differing propensities to outmigrate, in that some are more or less likely to migrate based on their circumstances.

We begin by looking at the aggregate group of Grade 2-4 students based on:

- Their district
- The school year
- Their circumstances (what happened to them – did they remain in the district since the prior year, move to a different district, or leave B.C. altogether?)

The unique combination of these three factors – district, school year, and "circumstances" – is what makes the critical difference in the likelihood that they will leave B.C.

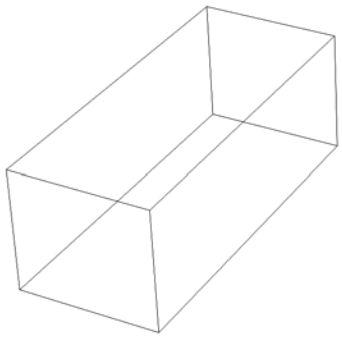
Each circumstance implies a different probability of outmigration that is factored into the likelihood estimate. The three circumstances are:

A. The student was in the same district the previous year.
B. The student was in a different district, but still in B.C., the previous year.
C. The student was not in B.C. the year before. (This rate is different because the likelihood that such students will outmigrate is statistically greater.)

[1] The assumption is that the behaviour of Grade 8 through 12 students can be predicted accurately based on the behaviour of their Grade 2 through 4 counterparts *in terms of outmigration*.

Because there are 60 school districts, 6 school years (in the six-year completion rate model), and 3 circumstances that are combined to create the estimated likelihood of outmigration, this means that a student in any single year will be assigned a likelihood based on one out of 1,080 possible combinations of these factors.

In its Education Data Warehouse, the Ministry of Education creates a table that contains these three dimensions. You can think of it as a physical cube with three axes *(see right)*.



- The horizontal axis from front to back is divided into 3 rows (one for each of the three "circumstances").
- The vertical axis from top to bottom is divided into 60 rows (one for each of the districts).
- The horizontal axis from left side to right is divided into 6 rows (one for each year in the cohort).

The place where each row intersects the other two is a *cell*. Each cell contains a unique number that is calculated based on its unique combination of characteristics. This is the likelihood that is then assigned to each individual student in the actual Completion Rate cohort. Researchers look at six cells, one per cohort year. These six cells may be scattered widely within this cube.

This information can be represented visually like this:

District	Circum-stance	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Weighted Average[2]
005	A	0.021	0.022	0.020	0.021	0.024	0.023	*n.nnn*
005	B	0.090	0.089	0.093	0.090	0.092	0.091	*n.nnn*
005	C	0.086	0.087	0.085	0.088	0.085	0.086	*n.nnn*
006	A	0.023	0.024	0.023	0.025	0.024	0.023	*n.nnn*
006	B	0.091	0.090	0.090	0.092	0.093	0.094	*n.nnn*
006	C	0.085	0.088	0.085	0.087	0.088	0.086	*n.nnn*
…	…	…	…	…	…	…	…	
092	A	0.023	0.024	0.023	0.021	0.022	0.020	*n.nnn*
092	B	0.092	0.093	0.089	0.093	0.090	0.090	*n.nnn*
092	C	0.087	0.085	0.088	0.085	0.085	0.088	*n.nnn*

[2] The weighted average – more properly called a *weighted average likelihood* – is described more fully on page 4 (under step 3). For now, it's enough to know that the Ministry of Education calculates an average so as to get a figure that is generally true across all years.

Ultimately, researchers will match each individual student in the cohort to the Grade 2-4 student subgroup with the same characteristics (circumstances, district, year). They then estimate that cohort member's likelihood of outmigration on that basis.

Because each student's outmigration likelihood in any given year is based on that of the corresponding Grade 2-4 cohort (and its unique combination of circumstances/district/year), and since the Grade 2-4 cohort is created afresh each year, the figure for each year for the student is likely to be unique. (Furthermore, the figures for the six years are summed up and given a *weighted average* – which provides another unique number.)

This is why there is so much variance among outmigration likelihoods.

Calculating the Grade 2-4 proxy group's likelihood of outmigration

The outmigration likelihood of the proxy group of Grade 2-4 students is calculated by identifying how many of the Grade 2-4 students (with each available combination of district/year/circumstance):

- failed to appear in any B.C. school district in the following year, and
- were not present in any B.C. school district in Year 6.

Because students in these early grades cannot technically drop out, their failure to appear is a reasonably reliable indication that they left the province. For example, if 10 out of one hundred Grade 2-4 students in that district in that year with the same circumstance fail to appear in the following school year, that represents a "likelihood to outmigrate" of 0.1 for that group.

In each year of the six-year period, the likelihood is estimated afresh. So, in Year 1 the estimated likelihood is based on the Grade 2-4 students in that year, in that district, for each circumstance. In Year 2, the likelihood is based on the Grade 2-4 students in *that* year, in that district, for each circumstance. **We are not tracking a parallel cohort of elementary-school students through the six years of the completion rate period.**[3]

The estimated likelihood is calculated as a fraction of a student. For example, we can say that there is a 10 per cent likelihood that a student may outmigrate, based upon the behaviour of that student's proxy counterparts in Grades 2-4. The number that is created in this case is 0.1, or "one-tenth of a student". If there are 100 such students in the district, and – for the sake of this example – they all share the same circumstances and therefore contribute the same fractional number – then the calculated number of outmigrants for this scenario in the district in that school year would be 100 x 0.1, or 10 students in total.

[3] For example, the Grades 2-4 kids in 2005/2006 are not identical to the Grades 2-4 students in 2006/2007 (although a majority of the students in Grades 3 and 4 were probably in Grades 2 and 3 the previous year).

Performing the full calculation for estimating outmigrants

This calculation is performed for each district/circumstance combination. The following example uses "circumstance A" (= the student was in the same district in the previous year). These steps must also be performed separately for circumstances B and C.

Step 1

To calculate the estimated number of outmigrants for each district for "circumstance A":

1. Find all students who were in Grades 2, 3 and 4 in that district in the first year and who were in circumstance A.
2. From these, count only those who were not present in British Columbia
   - in the following year, **and**
   - as of September of the last year of the cohort.
3. Perform this count for every remaining year of the cohort.[4] For the six-year completion rate, this will yield six numbers in total.

Step 2

Add these six numbers to get the total number of Grade 2-4 outmigrants (for that district/circumstance combination) across all years.

Step 3

Divide the number obtained in Step 2 by the total number of ALL Grade 2-4 students *across all years* (for that district/circumstance combination).

The result is called a *weighted average likelihood*. It describes the *overall degree* to which a Grade 2-4 student in a particular district is likely to be an outmigrant, depending on which of the three circumstances the student is in. (Note that this likelihood is fractional – meaning that it's a "percentage of a student".)

Step 4

We then use the result of Step 3 (the weighted average likelihood) to estimate the outmigration likelihood for each particular year for the corresponding Completion Rate cohort member (with that district/circumstance combination) – regardless of which year that cohort student was actually in.

[4] Because Year 7 data is usually not available at the time the six-year completion rate is prepared, the Year 5 data provides our estimate for both Years 5 and 6. Similarly, the seven-year model uses Year 6 for both Years 6 and 7, while the eight-year model uses Year 7 for both Years 7 and 8.

Step 5

Add all the outmigration likelihoods for the cohort in the district, across all years and for all three circumstances, to obtain the summed likelihood for the cohort. This figure is called **Outmigrations** in the following formula.

Thus, the formula for calculating the Six-Year Dogwood Completion Rate at district level is:

Successful students (Total District Completions)
divided by **(All students in the cohort - Outmigrations)**
at the end of the six-year period