

Random Selection for the Fiscal 2014/15 Merit Performance Audit

PREPARED FOR THE OFFICE OF THE MERIT COMMISSIONER
BY BC STATS – OCTOBER 2015, AMENDED APRIL 2016



BCStats

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Acknowledgements: The Office of the Merit Commissioner

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Publish date: October 2015, Amended April 2016

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Background

The Office of the Merit Commissioner was established by legislation in August 2001. Under this legislation, the Merit Commissioner is responsible for performing annual audits of public service appointments, as part of a program of monitoring the application of the merit principle under section 8 of the *Public Service Act*. The results of the audits are reported to the Executive of ministries and other organizations. The aggregate results are also communicated to the Legislative Assembly.

The audits assess whether recruitment and selection practices have resulted in appointments based on merit, and whether individuals possess the required qualifications for the position to which they were appointed. This requires a close study of the details of each appointment audited by an expert in staffing processes. BC Stats makes the selection of appointments to be audited on behalf of the Office and follows a comprehensive sampling approach to ensure that the appointments selected for the audit are both random and as representative as possible based on size of organization and type of appointment within the total population of appointments that have occurred each year.

Over the years the sampling approach for selecting the appointments has fluctuated year to year, while striving for continued generalization of the audit results to the total population of appointments. In the 2014/15 audit, the rate was set at 6%, which meant 243 appointments were audited from an adjusted population of 3,915 appointments occurring during this period.¹

Table 1 summarizes the in-scope population and sample totals of appointments across audit years since the establishment of the Office of the Merit Commissioner as an independent office in 2006.

¹See “Random Selection of Cases” for a full discussion of the number of appointments originally put forward for audit. A certain proportion, upon review, was deemed out of scope and this proportion was then estimated back into the original population.

TABLE 1: YEAR -OVER-YEAR COMPARISON OF IN-SCOPE POPULATION AND SAMPLE COUNTS

Year	Number of Appointments	Number of Audits	Sampling Rate
2006	3,754	308	8.2%
2007	5,508	531	9.6%
2008 ¹	n/a	n/a	n/a
2009	2,429	302	12.4%
2010 ²	942	183	19.4%
2011	3,942	222	5.6%
2012	3,928	256	5.8%
Fiscal 2013/14 ³	2,010	150	7.5%
Fiscal 2014/15	3,915	243	6.2%

Note 1: An audit was not conducted in 2008 and, as a result, there is no information that can be provided for the 2008 calendar year.

Note 2: The 2010 audit was a partial year audit, covering appointments from September through to December, 2010.

Note 3: The 2013/14 audit was the first fiscal year audit, which covered seven months of appointments from September 1, 2013 to March 31, 2014 to synchronize with the 2013/14 fiscal year.

Appointment Population

The Office of the Merit Commissioner defined the population of appointments for the fiscal 2014/15 audit according to two key factors:

- Type of appointment
- Size of the organization from which the appointment was made

The fiscal 2014/15 audit timeframe was April 1, 2014 to March 31, 2015. The types of appointments audited included direct appointments, permanent appointments and temporary appointments of more than seven months. The remaining appointments within the Merit Commissioner's jurisdiction of appointments made under Section 8 of the *Public Service Act* (such as auxiliary appointments and temporary appointments of seven months or less), were excluded from the audit population. Based on these query parameters, a final population of 4,045 appointments was identified.

Sample Selection

The objective of the Office of the Merit Commissioner's merit performance audit is to randomly sample all permanent new hires, promotions, direct appointments and temporary appointments greater than seven months in order to obtain an unbiased picture of the application of the merit principle under the *Public Service Act*. However, while a random sample offers a generally unbiased representation of an overall population, the sample's representativeness for specific groups within the population may be limited due to constraints imposed by the size of the population and the sample. For this reason, the population was stratified prior to sample selection to ensure adequate representation in the final sample. The data stratification process is described later in this report.

Eligible B.C. Public Service (BCPS) appointments took place across four intervals:

- April 1 – June 30, 2014
- July 1 – September 30, 2014
- October 1 – December 31, 2014
- January 1 - March 31, 2015.

Eligible appointments within the Liquor Distribution Branch (LDB) were sampled twice from their own source data for appointments that took place between April 1 – September 30, 2014 and October 1, 2014 - March 31, 2015.

For the 2014/15 audit which began in April 2014, the sampling rate was set at 6% for the 2014/15 fiscal year appointments. Sampling rates were adjusted slightly up or down for each sample drawn, depending on errors found in classification of appointments. Efforts were made to reach as close to a true sampling rate of 6%, regardless of rounding error.

For each sample interval, a cumulative list of appointments made was provided to BC Stats. The list was filtered to distinguish appointments that had already appeared in any previous sample. In addition to identifying new appointments, the filtering process was also used to identify unique appointments for employees with multiple entries in the cumulative list. This filtering process provided a final population of appointments from which independent samples could be drawn.

In total, six samples were drawn at different intervals during the 2014/15 fiscal year period for auditing. A summary of the six samples and their associated sampling rates are provided in Table 2.

TABLE 2: 2014/15 SAMPLE AND POPULATION COUNTS AND RATES

Organizations	Sampling Interval	Population	Sample Size	Systematic Sampling Rate	Actual Sampling Rate
BC Public Service (excluding LDB)	Apr 1 - Jun 30, 2014	1,083	65	6.0%	6.0%
	Jul 1 - Sept 30, 2014	912	64	7.0%	7.0%
	Oct 1 - Dec 31, 2014	787	47	6.0%	6.0%
	Jan 1 - Mar 31, 2015	1,077	63	5.8%	5.9%
Liquor Distribution Branch	Apr 1- Sept 30, 2014	91	7	7.0%	7.7%
	Oct 1, 2014 - Mar 31, 2015	95	6	6.0%	6.3%
TOTAL		4,045	252	6.0%	6.2%

Note: The systematic sampling rate represents the initial rate at which sample points were drawn from a sample window as none of the population sizes were evenly divisible by their respective samples. Based on the sampling plan summarized in Table 2, a final sample size of 252 appointments was drawn from the total population of 4,045 appointments with 9 identified as out-of-scope, leaving a total of 243 audited appointments out of an estimated total in-scope population of 3,915.

In addition to the influence of random start counts, as none of the population sizes were evenly divisible by their respective systematic sample rate the actual sampling rates slightly differed from the systematic rates. Using a set of category definitions similar to those used in previous annual audits, the fiscal 2014/15 appointments were stratified by their size and appointment type. The two categories chosen for fiscal 2014/15 were defined as follows:

- Ministry/organization size: up to 1,000 employees, and larger than 1,000 employees
- Appointment type: permanent appointment, temporary appointment of more than seven months and direct appointment

In fiscal 2014/15, as in previous audits, certain portions of the population were under-sampled so as to better optimize the distribution of the full sample. A post-stratification weighting adjustment ensured that any bias introduced by disproportionate sampling was minimized in the final population estimates. In total, a set of 26 unique weights were created to adjust for bias in the overall sample.

Of the 252 randomly-sampled appointments, the Office of the Merit Commissioner identified nine cases as being out-of-scope, primarily due to coding errors in the source data. These nine cases were removed from the sample, leaving 243 in-scope appointments that were audited.

BC Stats used the strata information to estimate back into the original population, an estimate of how many cases would likely be deemed out-of-scope if the entire population of cases had been audited. The statistics presented in the next section of the report are based on this reduced population (243/3,915). Random sampling was then used to ensure broad-based auditing of all appointments. Sampling independently in the above-mentioned categories ensured correct proportional coverage of differently-sized organizations/ministries and appointment types.

Distribution of Audits

The following two tables show how the audits are distributed according to various characteristics of appointments. The tables (appointment type and ministry/organization size) represent the categories that were used in sample stratifications. In all cases, percentages were rounded to the first decimal place, and total to 100%.

The relatively close correspondence between the sample percentages and percentages within all appointments on the majority of strata indicates that they are reasonably representative of the total population. As discussed above, unique weights were created to adjust for bias in the overall sample. The adjusted numbers of appointments in the following tables reflect weight-adjusted, in-scope number of appointments for each sample stratification type. Each table has unique in-scope weights attributed to the appointments dependent upon appointment type or organization size.

TABLE 3: AUDITS BY APPOINTMENT TYPE

Appointment Type	Adjusted Number of Appointments	Percent of All Appointments	Number of Audits	Percent of All Audits
Permanent Hire	3,606	92.1%	212	87.2%
Temporary > 7 Months	297	7.6%	26	10.7%
Direct Appointment	12	0.3%	5	2.1%

TABLE 4: AUDITS BY ORGANIZATION SIZE

Organization Size	Adjusted Number of Appointments	Percent of All Appointments	Number of Audits	Percent of All Audits
Large	2,832	72.3%	164	67.5%
Small	1,083	27.7%	79	32.5%

Note: Organization size was based on total regular employment at the start of the study period. In this table, organizations with more than 1,000 employees were deemed large, and organizations with 1,000 employees or less were deemed small.

Estimates and Confidence Intervals

In order to apply confidence intervals to the estimates for the fiscal 2014/15 audit, BC Stats employed a methodology that was similar to what was used in the 2010, 2011, 2012 and fiscal 2013/14 audits. As with those previous audits, the confidence intervals in fiscal 2014/15 were based on a Poisson distribution, whereas the confidence intervals from years prior to 2010 employed an F-distribution. While both methods provided accurate estimates, the Poisson offered a greater degree of flexibility, particularly for generating estimates for ‘rare events’. For the purposes of the merit findings and the performance audit report, a ‘rare event’ would include findings of Merit Not Applied (MNA).

In order to minimize sample bias and produce the best estimates, the micro data was weighted prior to generating the estimates. Due to year-over-year changes in sampling rates and adjustments to the audit program, caution should be used when interpreting the cumulative audit results, especially when considering pre-2011 findings.

The 95% confidence interval can be interpreted as: the true statistic would be found within the upper and lower bounds for that interval 95 times out of 100 with repeated sampling. In the below table, we can be confident that the estimate for the ‘Merit Not Applied’ or ‘Merit with Exception (MWE)’ statistic) lies within 95% of the distribution.

TABLE 5: ESTIMATED AUDIT FINDINGS AND CONFIDENCE INTERVALS

Audit	Audit Finding	Estimate (weighted)	95% Confidence Interval	
			Lower	Upper
All Audits (2001-2014/15)	Merit Not Applied	4.6%	3.7%	5.5%
Fiscal 2014/15 Audit	Merit Not Applied	8.4%	5.0%	12.2%
	Merit With Exception	32.7%	25.7%	40.1%
	Total	41.0%	33.3%	49.4%

Note: As appointments for the 2010 audit were only drawn from a four month review, rather than the full 2010 calendar year, the 2010 merit results were not incorporated into the cumulative year-over-year results

In the fiscal 2014/15 audit, it is estimated that appointments with a MNA status make up an estimated 8% of all appointments. The true proportion of all MNA appointments may lie as low as 5% and as high as 12% in the total population. The combined estimate of appointments with results of Merit Not Applied or Merit with Exception (MWE) is over one third of all appointments (41%). The true proportion of combined MNA and MWE appointments cannot be known for certain, but the confidence interval indicates that the true proportion may lie as low as 33% or as high as 49% in the population.

This report has been amended from the original release (October 2015).

Uses and Limitations of Audit Results

BC Stats assists the Office of the Merit Commissioner to draw representative sample populations to mimic and predict merit principle application trends for the whole population of appointments in a given time period. A certain degree of error and uncertainty is normally expected in sampling, as well as in the statistics of interest, and the ranges of their probabilities. This expectation of error is captured through the application of the confidence interval. The confidence interval level (here 95%) describes the uncertainty associated with a sampling method given a range of possibilities both above and below the found statistic (\pm a percentage range).

With small sample sizes, such as those which occur with the 6% overall sampling rates in the audit appointment samples, the likelihood of variance (or difference within the samples when compared to one another) increases, and therefore so does the error associated with the sampling. This in turn increases the range of error (or variance) on the audit results of interest. Sampling rates should strive to achieve the lowest possible ranges on those statistics and as such, the confidence in being able to say that the samples represent the real world must be tempered with these errors and ranges in mind.

The appointments selected for auditing are random samples of all appointments, representative of the strata used in the sampling process occurring between April 1, 2014 and March 31, 2015.

In terms of year-over-year comparisons, while the number of audits conducted in fiscal 2014/15 (243) was more than in 2013/14 (150), the number was also a result of a larger population of appointments. The number of audits conducted in fiscal 2014/15 was based on available resources and the full twelve months of appointments, while the ongoing hiring constraints and shortened audit period reduced the number of overall appointments in the 2013/14 fiscal year. By combining the realities of audit resource constraints with the continuation of reduced rates but consistently applied, randomized, stratified complex sampling strategies, the samples and subsequent audit findings can be stated to be of reasonable statistical strength.



BC Stats is the provincial government's leader in statistical and economic research, information and analysis essential for evidence-based decision making. BC Stats, the central statistics agency of government, is excited to be taking a lead role in the strategic understanding of data sources and analysis across government. The goal is to increase overall business intelligence—information decision makers can use. As part of this goal, BC Stats is also developing an organizational performance measurement program. For more information, please contact Elizabeth Vickery.

Do you have feedback or questions about the content in this report?

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