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Canadian Midwifery Registration Exam: 2023 Technical Report

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EXECUTIVE SUMMARY

The goal of this report is to provide key aspects of test development and item performance for the Canadian Midwifery Registration Exam (CMRE). This includes examination development activities conducted to date, and results from the 2023 administrations.

- The CMRE is typically administered twice a year. In 2023, it was administered on May 4, 2023 and October 26, 2023. Two separate exam forms were created for two administrations, with each exam form consisting of 180 items. All exams were administered via computer-based testing. In May administration, 77 out of 109 candidates chose to write their exam online with proctoring, while 32 candidates wrote their exams at a test centre. In October administration, 11 candidates wrote the exam via online proctoring, while 5 candidates wrote the exam in-person at test centres.
- The examination uses a criterion-referenced approach to standard setting, namely the modified Angoff method. This method is advantageous in that the pass mark is determined based on the content and difficulty of the questions in the examination and not on group performance.
- To enhance validity, the examination is constructed according to an exam blueprint and, at the item-writing stage, each item is linked to a specific competency. The item writers and reviewers are registered midwives from across Canada. At least one authoritative reference is provided for each question.
- To enhance reliability, several measures are implemented to ensure that scoring is accurate. The integrity of the answer strings is checked multiple times through the scoring and reporting process. The Cronbach's alpha reliability index for the examination was 0.78 and 0.87 respectively, for May and October administration.
- The CMRE is administered in French and English. The test items are developed in English and subsequently translated into French. Two item review sessions were conducted, one from June 7-8, 2023 and another from October 16-18, 2023.
- Several methods are used to safeguard test materials including restricting staff access to item banks and test materials, network security measures, and the signing of security agreements by all participants involved in the examination. As of December 2023, the CMRE item bank consisted of 932 multiple-choice items, 737 of which were considered Operational items.

INTRODUCTION

The Canadian Midwifery Regulators Council (CMRC) sets and administers the Canadian Midwifery Registration Exam (CMRE). This exam is designed to assess applicants for midwifery registration to ensure they meet entry-level competency standards set out in the *Canadian Competencies for Midwives*. Candidates are assessed in their knowledge, application of that knowledge and their critical thinking abilities to meet entry-level competencies. The goal of the CMRE is to ensure that midwives gaining registration are competent practitioners providing a consistent standard of care across Canada.

This technical report outlines the key activities conducted for the 2023 CMRE and presents the status of the item bank for the program as well as factors that contribute to the validity and reliability of the examination.

EXAMINATION DEVELOPMENT

This section highlights the status of the examination program with regards to the current test blueprint, item bank status, and method of selecting item writers and item writing process. Test assembly and standard-setting activities related to the 2023 examination had been completed prior to Measure Learning's contracted mandate with CMRC.

Test Blueprint and Core Competencies

The May and October 2023 exams were based on the current *Canadian Competencies for Midwives* from the CMRC available at <https://cmrc-ccosf.ca/sites/default/files.pdf>.

Each question on the CMRE is linked to a particular competency, which are organized in the following categories:

1. Primary Care Provider
 - 1.A. Assessment
 - 1.B. Decision-Making
 - 1.C. Care Planning
 - 1.D. Implementation
 - 1.E. Population Health
 - 1.F. Reproductive and Sexual Health
2. Advocate
3. Communicator
4. Collaborator
5. Professional
6. Life-Long Learner
7. Leader

The blueprint stipulates that the examination will consist of multiple-choice questions, presented as either case-based or independent questions. Case-based questions include a set of three to six questions associated with a brief health-care scenario. Independent questions contain all the information necessary to answer the question without reference to other questions.

Questions are also classified according to contextual variables, such as health care setting (i.e., hospital or out-of-hospital) and health care situation (i.e., normal or abnormal). However, there is no specific percentage of questions on the examination assigned to these categories. Table 1 provides a summary of the CMRE blueprint which was applied in building the 2023 exams.

Table 1. CMRE Blueprint

STRUCTURAL VARIABLES		
Exam length	180 questions	
Question format	Format: questions	Multiple-choice
Presentation	Case-based questions	40-60%
	Independent question	40-60%
Cognitive Level	Knowledge/Comprehension	10-20%
	Application	45-65%
	Critical Thinking	20-30%
	1. Primary Care Provider	
	1.A. Assessment	10-14%
	1.B. Decision-Making	10-14%
	1.C. Care Planning	10-14%
	1.D. Implementation	13-18%
	1.E. Population Health	5-8%
	1.F. Reproductive and Sexual Health	5-8%
2. Advocate	8-12%	
3. Communicator	8-12%	
4. Collaborator	4-8%	
5. Professional	2-4%	
6. Life-Long Learner	2-4%	
7. Leader	6-10%	
CONTEXTUAL VARIABLES		
Health Care Setting	Hospital	
	Out-of-Hospital	
Health Care Situation	Normal	
	Abnormal	

In May 2019, the CMRC contacted Meazure Learning for assistance with the modernization of its CMRE competency profile. As part of this process, an updated CMRE competency profile was created to accurately reflect updated competencies required for competent performance of Canadian Midwives. As such, in 2021, a blueprint for CMRE based on the updated competency profile was developed. A detailed account of these development activities is described in the *CMRE Blueprint Revision Summary Report (2021)*. Implementation of the updated blueprint was intended for Fall of 2022 at which time the CMRE content will reflect the new blueprint specifications.

Item Bank Status

As of December 2023, the CMRE item bank had a total of 932 items, of which 737 were Operational, and is, for the most part, meeting the needs for examination development. Tables 2, 3, and 4 present a breakdown of operational items - by competency category, taxonomy, and item type respectively - of the number of questions in the item bank versus the percentage of items required for the exam blueprint.

Although examination development can be supported with the current item bank, continued item development is required across all competency categories, and mainly non-clinical categories to improve the health of the item bank.

Table 2. Items currently in bank by competency category

Competency Categories	# of Items in Bank (Percent)	% Indicated on Blueprint
1. Primary Care Provider	686 (74%)	
1.A. Assessment	171 (18%)	10-14%
1.B. Decision-Making	86 (9%)	10-14%
1.C. Care Planning	69 (7%)	10-14%
1.D. Implementation	269 (29%)	13-18%
1.E. Population Health	19 (1%)	5-8%
1.F. Reproductive and Sexual Health	72 (8%)	5-8%
2. Advocate	9 (1%)	8-12%
3. Communicator	15 (2%)	8-12%
4. Collaborator	45 (5%)	4-8%
5. Professional	63 (7%)	2-4%
6. Life-Long Learner	31 (3%)	2-4%
7. Leader	26 (3%)	6-10%
Total	875* (100%)	100%

**Items missing from count have been retired and classified according to the old competency categories.*

Table 3. Items currently in bank by taxonomy

Taxonomy levels of cognitive ability	# of Items in Bank (Percent)	% Indicated on Blueprint
Knowledge/Comprehension	380 (41%)	10-20%
Application	358 (38%)	45-65%
Critical Thinking	170 (18%)	20-30%
Total (Percent)	908* (100%)	100%

**Items missing from count have been retired and classified according to the old competency categories.*

Table 4. Items currently in bank by Item Type

Item Type	# of Items in Bank (Percent)	% Indicated on Blueprint
Independent	539 (58%)	40-60%
Case-Based	393 (42%)	40-60%
Total (Percent)	932 (100%)	100%

A new competency framework and exam blueprint was developed and implemented starting the Fall of 2022. Preliminary work was completed throughout the Summer of 2021 to prepare for the remapping of current items in bank to the new competency categories. First, a comparison of the current and new competency framework was conducted to identify competency categories and indicators which are identical across frameworks. Items for which competency categories and indicators were identical underwent a bulk update to automatically recode items to the new framework. Second, for the remaining items in bank, subject matter experts (SMEs) were asked to review items and determine their new competency category and indicator. SMEs worked in pairs to review a set number of questions independently and then validate their classification with their counterpart. The item bank remapping was completed in 2022.

Item Review

In 2023, two item review sessions took place to review any newly written or flagged items. The first session took place between June 7-8, 2023. The second item review session took place between October 16-18, 2023. Item reviewers received training at the beginning of each session that focused on how to review quality of multiple choice items, how to detect potential red flags, and were also provided with a checklist of guidelines as a reference. All subject matter experts had signed a non-disclosure agreement to protect security and integrity of the CMRE item bank.

Method of selecting item reviewers

Item reviewers for the CMRE are registered midwives and they are recruited and approved by the CMRE Committee. During item review, subject matter experts were asked to review 1) newly written questions and 2) questions that have been flagged as having questionable statistics or outdated content.

Item review participants: June Session

The following individuals participated in a virtual item validation session on June 7-8 2023:

- Kirsten Helen
- Lourie Rose
- Nicole Romeiko
- Sylvia Miedinger

Item Review Outcome: June Session

In total, over the course of the 2-day item validation session, out of the total 121 items flagged for review, 40 items were reviewed by SMEs. 23 items were approved for translation, 1 item was retained as operational, 14 items were flagged for further review/rework, and 2 items were retired.

Item review participants: October Session

The following individuals participated in a virtual item validation session on October 16-18 2023:

- Andrea Houle
- Fallon Cooper
- Geneviève Lamarche
- Jem Deguire
- Kirsten Helen
- Lourie Rose
- Nicole Romeiko

Item Review Outcome: October Session

In total, over the course of the 3-day item validation session, out of the total 79 items flagged for review, 73 items were reviewed by SMEs. 26 items were approved for translation, 5 item was retained as operational, 39 items were flagged for further review or rewrite, and 3 items were retired.

Standard Setting

In 2023, two standard setting meetings took place to add Angoff ratings to all the newly developed, or newly reviewed and updated items in 2022 and 2023. The first standard setting meeting took place over a 2-day period; on January 23, 2023, and January 25, 2023. During this meeting, all items developed, reviewed and made Operational in 2022 were used for standard setting, and were assigned ratings to. The second standard setting meeting took place over a 2-day period; on December 5, 2023 and December 6, 2023. During this meeting, all items that underwent review and made Operational were used for assigning ratings.

In the beginning session of the meeting, the standard setting panelists received training on Modified Angoff procedure. This was followed by the panel discussion that focused on behaviours and skills exhibited by the minimally competency midwives, in context of the competencies listed in the competency profile. The panelists were provided with Angoff tips to be used as guidance while assigning ratings. The panelists then practised with ratings assignments task on some questions. After the practice session, the meeting facilitator pointed out any discrepancies in the ratings, and provided item statistics data when it was available, to guide their ratings.

The panel provided their individual Angoff ratings in two rounds. After the first round of ratings, all items with discrepancies in ratings were brought up for discussion by the facilitator. Post discussions, the panel provided their final round 2 ratings.

Standard Setting panelists

All subject matter experts participating in the standard setting meeting were registered midwives and they are recruited and approved by the CMRE Committee. The standard setting panel was a diverse group of midwives practising all across Canada, with varied years of experience in the field.

Standard Setting panelists: January Session

The following individuals participated in a virtual standard setting session in January 2023:

- Andrea Houle
- Diana Doe
- Emma Seager
- Emmanuelle Dennie-Filion
- Lourie Rose
- Patricia Rohlfs
- Rebecca Wood
- Sarah Kirkland

Standard Setting panelists: December Session

The following individuals participated in a virtual standard setting session in December 2023:

- Cat de Cent
- Kerstin Helen
- Lourie Rose
- Nicole Waithe
- Tarina Mosley

All items that were newly written, reviewed, approved, and translated were assigned ratings to. In the January session, 172 items were updated with Angoff ratings. In the December session, 54 items were updated with Angoff ratings. All items that were standard set were uploaded into the item bank with their Angoff values, and became available to be included on the subsequent exam forms.

Examination Construction

Exam configuration and match to blueprint

The CMRE examination consists of 180 multiple-choice items. The exam consists of case-based items and independent items. Case-based and independent questions are distributed throughout the exam form. The exam was administered twice in 2023, the first administration being in May and the other administration being in October.

Table 5 provides a summary of case-based and independent item representation on each exam part for the 2023 examination. Table 6 provides the number of items in the 2023 examinations by competency category and taxonomy level. For the 2023 examinations, blueprint requirements were met.

Table 5. CMRE Distribution of Case Study and Independent Items for 2023 Exams

Administration	Case Study Items	Independent Items	Total
May 2023	75	105	180
October 2023	73	107	180

Table 6a. May 2023 CMRE items according to blueprint competencies

Competency	Blueprint %	CMRE Exam #	CMRE Exam %
1. Primary Care Provider	(min. 60%)		
1.A. Assessment	10 – 14%	27	15%
1.B. Decision-Making	10 – 14%	18	10%
1.C. Care Planning	10 – 14%	18	10%
1.D. Implementation	13 – 18%	33	18%
1.E. Population Health	5 – 8%	9	5%
1.F. Reproductive Health	5 – 8%	9	5%
2. Advocate	8 – 12%	15	8%
3. Communicator	8 – 12%	16	9%
4. Collaborator	4 – 8%	11	6%
5. Professional	2 – 4%	5	3%
6. Life-long Learner	2 – 4%	6	3%
7. Leader	6 – 10%	12	7%

Table 7b. October 2023 CMRE items according to blueprint competencies

Competency	Blueprint %	CMRE Exam #	CMRE Exam %
1. Primary Care Provider	(min. 60%)		
1.A. Assessment	10 – 14%	22	12%
1.B. Decision-Making	10 – 14%	21	12%
1.C. Care Planning	10 – 14%	20	11%
1.D. Implementation	13 – 18%	31	17%
1.E. Population Health	5 – 8%	9	5%
1.F. Reproductive Health	5 – 8%	12	7%
2. Advocate	8 – 12%	16	9%
3. Communicator	8 – 12%	14	8%
4. Collaborator	4 – 8%	10	6%
5. Professional	2 – 4%	4	2%
6. Life-long Learner	2 – 4%	7	4%
7. Leader	6 – 10%	14	8%

EXAMINATION ADMINISTRATION

The examination administration activities in this section include examination administration dates, duration and modality along with summary statistics regarding the 2023 examination.

Examination Dates and Duration

In 2023, the CMRE was administered on May 4, and October 26 using computer-based testing either proctored online or in test centres.

Administration Modality

In May 2023, a total of 109 candidates wrote the exam. All exams were administered using computer-based testing. 77 out of 109 (70.6%) candidates chose to write their exam online with proctoring, while 32 (29.4%) candidates wrote their exams at a test centre. In October 2023, 16 candidates wrote the exam via computer-based testing. Of these, 11 (68.8%) candidates wrote the exam via online proctoring, while 5 candidates (31.2%) wrote the exam in-person at test centres. Online proctoring was offered through Meazure Learning-Proctor U. Meazure Learning-Proctor U offers a highly secure and standardized online testing environment. Proctors are selected and trained by Meazure Learning-Proctor U. They undergo a rigorous training process and ongoing audits are performed to ensure procedural compliance and ability to identify nefarious examinee behaviours. Proctors do not have access to test content; strict access controls are in place to allow for authorized personnel only to access client data.

Delivery of Examinations via Proctored Computer-based Testing

Approximately 10-12 weeks prior to the scheduled examination administration date, CMRC provided Meazure Learning with a list of candidates who were eligible to write the CMRE. The list of candidates was uploaded into Meazure Learning's software program. Meazure Learning performed quality assurance checks to ensure accuracy of candidate information following which each candidate received a link to book their exam time.

Scoring and reporting

Following examination administration, item analyses was conducted to identify poorly performing items. Thirteen (13) items were flagged for review in May administration, and 18 items were flagged for review in October administration. A panel of subject matter experts reviewed these questions to ensure they were properly keyed, unambiguous, fair, and appropriate for entry to practice. One item was removed from the scoring of the May exam and flagged for review, while no items were removed from October administration. Thus, May exam scores were calculated based on candidates' performance on 179 items, and October scores were calculated based on all 180 items.

Individual candidate scores were sent to the CMRE Committee. Unsuccessful candidates receive a detailed profile that provides examination score point percentages by blueprint category. Successful candidates receive a “pass” notification indicating that they have passed the examination.

Summary statistics for the two exams are included in table 7. It must be noted that average proportion correct was very high (0.88) for the May administration. This indicates that a significant portion of the exam content was relatively very easy for test-takers. Ideally, only a limited number of exam items with an item difficulty over .90 would appear on an exam, whereas most items would be of moderate difficulty (i.e., p-value of .50 to .70). Average proportion correct was lower for the October administration. However, all statistics from October administration need to be interpreted in light of very limited number of candidates writing the October exam.

Summary Statistics for the 2023 Administrations

Table 8. Summary of the statistics for the 2023 administrations of the CMRE

Exam parameters for English and French	May 2023	October 2023
Total number of multiple-choice (MC) items	180	180
Number of items excluded based on poor psychometric properties	1	0
Total of number of items included	179	180
Minimum obtained score	111 (62.0%)	117 (65.0%)
Maximum obtained score	171 (95.5%)	161 (89.4%)
Mean (Average) score	158.94 (88.8%)	142.5 (79.2%)
Median (half the scores are above the median and half are below the median)	160.00 (89.4%)	143.00 (79.4%)
Standard deviation	7.73	12.93
Mean (Average) proportion correct	0.88	0.78
Mean (Average) item-total correlation	0.14	0.14
Reliability coefficient (Alpha)	0.78	0.87
Pass mark and Pass rate		
Pass mark (%)	133 (74.3%)	131 (72.8%)
Number of candidates writing the exam	109	16
Pass (N)	107	12
Pass (%)	98.17%	75%

Validity

Validity is defined as “the evaluative judgment of the degree to which empirical evidence and theory rationale support the adequacy and appropriateness of inferences and actions based on test scores” (Messick, 1989). The validity of credentialing tests is based primarily upon content validity or how well the content of an examination reflects the concepts it is intended to measure as outlined in the blueprint.

As described in the item development section, all items are developed according to the established blueprint and approved for the CMRE. Items are then reviewed and edited at various stages of the process by subject matter experts who have been trained in developing high-quality test items. Items are also reviewed after performance statistics are available to ensure that they have adequate statistical performance.

Thus, through extensive subject matter expert involvement in the development of the examination items, and efforts made to control the construct under representation and construct-irrelevant variance, the 2023 CMRE met and/or exceeded testing industry standards with respect to all issues involving its content validity.

Although p-values are an indicator of item difficulty rather than direct evidence in support of validity, the high proportion of items with p-values over 0.90 and the significantly high pass rate is noteworthy. As such, it is important that continued efforts be made to ensure that items on the exam target the appropriate level of competence. It is essential that subject matter experts involved throughout the development of the exam have a sound understanding of expected standards for entry-level midwives.

Reliability

Reliability in testing is defined as the degree to which test results are consistent with repeated measurements (Pedhazur & Schmelkin, 1991). Reliability is the consistency of a set of measurements or measuring instrument. In other words, a reliable instrument will consistently make the same judgment regarding a candidate's ability.

The reliability coefficient for CMRE in May 2023 was 0.78, and that for October administration was 0.87 (see Table 7). For certification exams such as CMRE, a reliability value above 0.75 is recommended. Despite an acceptable reliability, the significantly high proportion of items with p-values in the range of 0.85 - 0.90 suggest that it remains important to continue the review and revise items with non-functioning distractors as items with low variations in responses are inconsequential to exam reliability.

CONCLUSION

Based on the information reviewed, there is strong evidence to support the assertion that the CMRE is congruent with the blueprint specifications outlined in the current *Canadian Competencies for Midwives* and hence a valid assessment for entry-level midwives. To ensure validity at the item-writing stage, each item is linked to a specific competency, at least one authoritative reference is provided for the correct answer and items are reviewed and edited at various stages of the process by SMEs who have been trained in developing high-quality test items. Similarly, the reliability value was found to be above the recommended threshold of 0.70 for certification examinations.

Despite strong evidence in support of CMRE's validity and reliability, the high proportion of items with p-values around 0.90 and the significantly high pass rate is notable. Although infrequent such results are not unfounded; professional cohorts in which candidates undergo rigorous post-secondary training can justifiably find exam content to be easy. It is recommended however, that continued efforts be taken to ensure content validity and reduce the number of items with non-functioning distractors.

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