

# **A new (and better) way to measure individual financial capability**

Research report

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## Acknowledgements

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This study expands on prior work conducted by the lead author under contract to Prosper Canada and published by Prosper Canada's Centre for Financial Literacy (see: "Piloting a personal financial literacy quiz in Canada" available online at:

<http://prospercanada.org/Resources/Publications.aspx>. The resulting 16-question instrument from that developmental work can be viewed on line at

<http://prospercanada.org/Resources/Financial-Literacy-Evaluation-Tools/Tracking-Outcomes.aspx>

## Introduction

Financial literacy has been associated with a wide range of economic and social outcomes.<sup>i</sup> But what is financial literacy and how should it be measured? As Sandra Huston points out, there is no consensus on *what* should be measured and many existing tests do not meet certain professional standards for instrument design and implementation.<sup>ii</sup>

One approach is to measure financial literacy as a specialized form of literacy – more specifically, as an ability to understand and use financial information. This approach suggests functional approaches to measurement and assessment. In functional tests, individual respondents are asked to perform a task and their performance is thought to reflect their underlying literacy. This has been applied in to other subject areas including health literacy.<sup>iii</sup> In 2012, the OECD Programme for International Student Assessment (PISA) adopted this approach to measuring financial literacy of students aged 15 years in 18 participating countries. The PISA study measured participants' numeracy, document literacy and financial literacy through a series of test tasks or problems to solve.<sup>iv</sup> These test tasks, however, can take several hours to administer and require specialized evaluators to assess performance. The selection of tasks and standardization may present challenges to reliability and validity if the nature and difficulty of the tasks cannot be reasonably applied to the target population and administered in a way that minimizes measurement error (for example, experimenter demand effects or respondent anxiety in a test-taking environment).

Other researchers have instead developed questionnaires based on objective knowledge. For example, the Jump\$tart Coalition for Personal Financial Literacy in the United States has surveyed American high school and college students since 1997.<sup>v</sup> Their test instrument for high school is composed of 31 factual questions that test respondent knowledge on specific financial topics such as banking rules, guidelines for investment and financial products.<sup>vi</sup> Likewise, Annamaria Lusardi and her colleagues have conducted several studies to relate financial literacy and financial outcomes such as retirement saving, indebtedness and household wealth.<sup>vii</sup> Lusardi's instruments, often revised for each study, ask a small set of questions to test the respondents' ability to recall financial information and conduct financial computations. The use of objective knowledge measures has also been used in studies conducted in Japan, Germany, Chile, Mexico and India, among others.<sup>viii</sup> The Canadian Financial Capability Survey, published by Statistics Canada in 2009 and again in 2014, also included a small module of object knowledge questions based on a similar national survey in the United Kingdom.

Instruments that rely heavily or entirely on objective knowledge face at least four challenges:

- 1) When these knowledge tests offer respondents a multiple choice format, there may be a greater risk of measurement error as participants guess at (whether correctly or not) the answer from the list of options presented.<sup>ix</sup>
- 2) When these test items require a mathematical solution, they may be more accurately measuring numeracy rather than the ability to manage personal finances in an adaptive way.
- 3) These instruments may not have a strong theoretical framework to support the selection of one objective question over another. Test items tend to rely on expert judgment of relevance and significance but that judgment may not be validated through empirical methods.
- 4) When test items are chosen based on the variables of interest in the particular study (for example retention of information in a Jump\$tart classroom program or information specific to retirement choices), it isn't clear that these instruments are evaluating a consistent and stable construct. If we define financial literacy one way retirement planning

but another for debt management, then our definition of financial literacy means that knowledge can't also be transferable from one type of decision or life-stage to another.

This latter point raises the troubling prospect that financial literacy might be entirely dependent on context, rather than some set of abilities inside of a test subject that can be applied (or not) across a range of topics in personal finance. In fact, this criticism of expert-chosen knowledge tests may help to explain the significant gender gap found in much of the literature that use these tests.<sup>x</sup> A finding of lower test scores for women may say more about the socio-cultural obstacles for women and girls in gaining and exercising specialized financial knowledge (or indeed economic knowledge given the nature of the questions on many of these instruments) than any gender differences in underlying financial ability. Furthermore, the research on financial knowledge and behavior finds that individuals will often act in ways that are inconsistent with their own knowledge,<sup>xi</sup> and that subjective information (self-assessed competence, for example) is often a better predictor of financial practices.<sup>xii</sup>

Another approach is to instead track population-level trends through surveys of financial attitudes and self-reported behaviors. A search of a database maintained by the OECD finds 79 different reports on efforts to measure national levels of financial literacy within or between countries as disparate as the United States, the United Kingdom, Serbia, Japan, Mexico and Indonesia.<sup>xiii</sup> The OECD has also invested considerable effort to develop and test one questionnaire that can be used in multiple countries, creating a basis for cross-country comparisons.<sup>xiv</sup>

These national studies are helpful for measuring trends over time or between group differences in one or more variables of interest. But they can be ill-suited for measuring individual financial literacy in an applied or experimental setting. The survey instruments tend to be lengthy and time-consuming to administer. For example, the Canadian Financial Capability Survey has well over 100 items and takes at least 45 minutes to administer by telephone. The surveys also include complex patterns that demand questions be skipped (or not), depending on answers to previous questions. This can be challenging to administer in paper format or with interviewers who may not have technical training with the survey instrument.<sup>1</sup> Even self-administration through computer-assisted technology is not always feasible or appropriate to some target populations.

Finally, and more fundamentally, the problem with these national surveys is that there is no clear way to assess individual responses and micro-level changes over time. By comparison, the task-based and knowledge-based approaches have correct (or at least more correct) answers and an individual respondent could be assessed against the established standard of the test item or instrument as a whole. But when questions are related to behavior or attitude, how should we empirically evaluate what is better or worse? Any approach must be guided by theory of what constitutes "financial capability" or "financial literacy". Theory can and should be supported by analysis to understand what is typical for a population and which behaviors or attitudes may be more (or less) significant in evaluating individual capability.

National do offer large sample sizes that permit empirical analysis to support the development of instruments that can be more easily administered and, secondarily, whose results can be interpreted relative to some nationally-representative data. This current study builds on an earlier effort to develop a new measurement instrument based on the questionnaire of the Canadian Financial Capability Survey.<sup>xv</sup>

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<sup>1</sup> Even a review of the Master File of the CFCS finds that the skip patterns are not always consistently followed even when the survey is administered by trained analysts using specialized software.

## Objectives of the current study

This study aims to validate the results of a 2012 pilot study that developed a short instrument to measure financial capability, using national survey results as reference point. More importantly, this study also develops a numerical scoring system to provide respondents with a transparent and easy to interpret method for differentiating low, moderate and high levels of personal financial literacy.

### Prior developmental work:

The initial 2012 pilot study relied on results from an exploratory factor analysis of the 2009 Canadian Survey of Financial Capability conducted for the Department of Finance.<sup>xvi</sup> That work, by Stephen McKay, used the master data file at Statistics Canada to identify relationships between over 50 survey items. The exploratory factor analysis resulted in five separate scales that provided an indirect measurement of five separate hypothesized domains of financial capability:

1. Making ends meet
2. Keeping track of money
3. Planning ahead
4. Choosing products
5. Staying informed.

As McKay notes, “new measures are not directly observed, but instead are inferred from the set of questions that were asked” (p.5). This exploratory analysis treats observable responses to questions as factors that, taken together, measure an underlying (or latent) variable. This is a contrast to task-based or knowledge-based measurement that treat responses as direct indicators of skill or knowledge.

The five domains identified by McKay are well-supported in the literature on financial *capability*.<sup>xvii</sup> That literature had also informed the work of Statistics Canada on the design of the national survey itself. It is worth noting here the switch to the concept of financial capability rather than financial literacy. To develop the personal financial capability measure for this study, I borrow from the work of Elaine Kempson and a team of researchers who surveyed hundreds of British households to find the common threads in how ordinary people understand good financial practice and described personal financial competence.<sup>xviii</sup> That developmental work led the researchers to propose the 5 domain model of financial capability mentioned above. While each of those domains may have a knowledge or skill component, Kempson and her colleagues suggest that it is behavior that should be of greatest interest to researchers and stakeholders. This approach has been echoed as well by Huston who suggests that the application of knowledge (capability) may be more important in shaping financial choices and decisions than the information stored inside an individual respondent. And, as mentioned above, research finds that self-reported behavior may be a more accurate indicator of actual practice than attitudinal or knowledge items in a measurement instrument.

The 2012 pilot study produced a 16-item instrument which I will refer to here as a *quiz*. Each item on the quiz is drawn from a question on the national survey questionnaire for the Canadian Financial Capability Survey. The phrasing of some questions was altered slightly to make the instrument suitable for independent administration.<sup>xix</sup> In several cases, and on the advice of expert reviewers, responses to several items were combined to yield richer information. For example, separate questions regarding budgeting are combined to give information not only on whether a respondent has a household budget but also how frequently he or she is able to follow

that budget. Likewise, separate questions on ongoing financial obligations are combined to give information on whether a respondent is falling behind on ongoing payments and the severity of the difficulty.

The 2012 pilot study included interviews with a sample of low-income adults who were asked to complete both the new quiz as well as all questions from the national survey questionnaire that were identified in McKay's exploratory factor analysis. The reliability of their responses on the two different instruments proved very robust.

## Methodology

This study uses data from the 2009 Canadian Survey of Financial Capability using the master file (full, confidential data) at the Research Data Centre at the University of Ottawa. A new, 2012, cycle of that survey is now available but could not be included in this study. The Public Use Microdata File does not include all of the variables of interest and proved unsuitable for this analysis.<sup>2</sup> The master file for the 2014 cycle could not be obtained in time for this project. However a preliminary review of responses in 2009 and 2014 amongst the Canadian population do not suggest significant shifts on the items of interest for this analysis. Larger sample sizes are always preferable and the 2009 data offers a sample of 27,555 adults aged 18+ while the 2014 survey includes data for just 12,620.

Table 1 (below), provides some illustrative examples of the differences in estimates obtained from each of the 2009 and 2014 surveys using the Public Use Microdata File. Note that these data are weighted to be representative of the population of adult Canadians.

**Table1: Comparison of 2009 and 2014 data from the Canadian Survey of Financial Capability (weighted)**

	2009 data		2014 data		CV 2009	CV 2014
	Frequency	%	Frequency	%		
Have a household budget						
Yes	13,233,740.70	50.5	12,486,707.60	45	0.08%	0.08%
No	12,636,382.70	48.2	14,766,164.50	53.3		
Don't know	304,242.70	1.2	458,758.00	1.7		
Refusal	38,072.90	0.1	11,596.90	0		
Total	26,212,439.00	100	27,723,227.00	100		
	2009 data		2014 data			
Self-assessment on keeping track of money						
Very good	8,105,705.00	30.9	9,004,674.20	32.5	0.09%	0.09%
Good	9,067,462.20	34.6	9,818,118.80	35.4		
Fairly good	5,728,805.40	21.9	5,824,108.10	21		
Not very good	1,699,455.50	6.5	1,458,711.60	5.3		
Don't know	129,892.60	0.5	119,056.20	0.4		
Refusal	54,570.20	0.2	28,907.20	0.1		
Not stated	1,426,548.20	5.4	1,469,651.00	5.3		
Total	26,212,439.00	100	27,723,227.00	100		

<sup>2</sup> For example, the Public Use file uses a composite variable to measure falling behind on payments that does not permit researchers to separate one type of payment from another.

I first created a dataset from the 2009 survey data to replicate the structure of the short quiz. A summary of the variables that were recoded is included at Appendix A. A complete list of questions (and the domains of financial literacy they are hypothesized to measure) is included in the first Tab of the Excel file that accompanies this report at Appendix B.

In certain cases, this involved creating a count instead of a series of “yes/no” answers to repeated options. In other cases, this meant combining responses to questions that were posed separately (such as a series of question on financial topics that the respondent followed). All quiz items are treated as ordinal and have at least 3 possible responses. The ranking from lowest to highest was based on the following decision rules:

- We have to treat participant responses at face value. There is no reasonable alternative.
- All else being equal, a response that indicates a lack of awareness or information (such as “I don’t know”) is less preferable to other options.
- Where responses in the questionnaire already have an underlying order (such as “Not very good” through to “Very good”), this should be retained.
- Where responses do not have an underlying order, an order can be inferred from theory and responses can be grouped into high, moderate and low capability choices.
- New response choices cannot be added to the set so the exercise is restricted by the range of responses included in the national survey data. New combinations of responses can, however, be derived based on the existing data.

The results of the initial rank ordering is available at Tab 2, Appendix B. Raw responses were then combined, on the relevant quiz items only, into derived responses (see Tab 3 of Appendix B). This resulted in a set of 16 different variables with different numbers of possible responses, from 3 possible responses to as many as 7.

Because this project is intended to create scores that can be easily calculated by users, the local and simple method is to treat components of one scale as additive. That is, items within a scale are added together to generate a score for “Keeping Track” or any of the other dimensions of financial capability. I will say more on this, below, after I address the independence of the five different scales.

Based on the available research, these separate dimensions appear to be independent of one another and national surveys show significant variety in individual patterns of responses. There is also insufficient research, as yet, to support a model of how the five components of financial capability might relate to one another.<sup>xx</sup> For example, do “Planning ahead” and “Keeping track” interact in some way to change outcomes on “Making ends meet”? There are equally-plausible arguments both for and against this hypothesis. Similarly, is one dimension more predictive than others of overall financial capability? Again the available evidence is insufficient to support the development of models regarding the relationships among the dimensions of financial capability. For this reason, the scoring system developed in the current project creates five separate scales. Users wanting to add them together to create one single score should do so with extreme caution.

Treating the component items of each scale as additive also requires that they have a common base to avoid artificially inflating results where items may have up to seven possible answers. As a result, the numerical value associated with each ordered response was re-coded to a common base of 3. The results are available at Tab 4 in Appendix B.

The formula for each of the five scales simply adds up the numerical value (based on the ordered) response to each of the contributing quiz items. However, McKay’s work demonstrated that individual questions have different levels of importance, or weight, in any composite measure

of financial capability. Therefore, each contributing item must be weighted in some way. This results in a formula for each of the five scales as follows:

$$X = f_1(Y_1) + f_2(Y_2) + f_3(Y_3)$$

Where X is the scale of interest (Keeping Track, Making Ends Meet, Choosing Products, Planning Ahead or Staying Informed), Y is the item from the quiz and f is the weight associated with that item.

## Results

I use confirmatory factor analysis to determine the factor loadings or weights for each item in the five scales of the quiz. Confirmatory factor analysis is a standard technique in psychometric research and the development of new measurement instruments.<sup>xxi</sup> While McKay's work with the CFCS data was exploratory, confirmatory factor analysis instead tests the fit of models where the researcher has ideas about how variables are associated and each variable loads only onto one factor. When used to create scales, factor analysis models use a series of test items to explain a latent or underlying variable. The factor loadings or weights are indicators of the strength of the association between the underlying latent variable and the variation in the observed variable.

Analysis was conducted using the Generalized Structural Equation Modeling module in Stata (version 14). The models were tested for each of the five scales separately and were adjusted for the complex sampling design (including bootstrap weights) of the Canadian Financial Capability Survey. Ordered logit models were used given the ordinal nature of the data and, based on McKay's results, the non-normal distribution of population responses. This approach constrains the factor loading of the first item to 1 and adjusts the factor loadings (or weights) of the subsequent items in relation to it. While other factor analysis methods usually lead to factor weights of between -1 and 1, fixing the first variable leads to a much greater range. Post-estimation tests for survey-adjusted ordered logit models are limited in Stata. Nevertheless, Wald tests confirmed fit of the models in all cases.<sup>xxii</sup>

The results from those five models give the following equations for the five separate scales in the quiz:

- Making Ends Meet (MEM) =  $q1(1) + q2(1.15) + q13(.46)$
- Keeping Track (KT) =  $q3(1) + q4(.64) + q5(7.79) + q14(7.35)$
- Planning Ahead (PA) =  $q6(1) + q7(1.06) + q8(.34)$
- Choosing Products (CP) =  $q9(1) + q10(1.07) + q16(.73)$
- Staying Informed (SI) =  $q11(1) + q12(.33) + q15(1.16)$

These are also represented graphically in a diagram at Appendix C of this report.

These results have been programmed into the fifth tab of the Excel workbook attached at appendix B. Given a common score of up to 3 for each item, the addition of the factor loadings or weights lead to scales with the following ranges:

*Table 2: Upper and lower limits for each of the five scales on the quiz*

Domain	MEM	KT	PA	CP	SI
Maximum score	7.827	50.346	7.2	8.4159	7.464
Minimum score	1.6005	13.1812	1.396	2.5129	1.0252
Wald test	F( 2, 15517) = 122.75 Prob > F = 0.0000	F( 3, 15516) = 77.39 Prob > F = 0.0000	F( 2, 15517) = 44.08 Prob > F = 0.0000	F( 2, 15517) = 292.69 Prob > F = 0.0000	F( 2, 15517) = 45.60 Prob > F = 0.0000

This method of scoring provides a numeric result with an absolute top and bottom limit. Users are able to interpret their results in relation to the top and bottom limits where higher numerical scores are thought to indicate better underlying capability on the specific domain of financial capability. For example, a score of 3.45 out of 7.827 would show a lower level of capability on “Making Ends Meet” compared to a score of 6.863.

These results provide an empirically-based approach to measuring financial capability and represents an improvement over metrics based on expert judgement alone. The relative importance or weight of one quiz item over another has been determined and is reflected in the scoring system. The questions have been grouped together, to measure underlying latent constructs and those models appear to be valid based on this analysis. However, the primary objective in developing the financial capability quiz was to design an instrument that could be broadly administered to adult Canadians, regardless of life stage, financial resources or family status. The resulting instrument should facilitate research by offering a standardized instrument for collecting and interpreting new data.

However, the same quiz is also intended to be used in community settings to support staff in assessing individual financial capability to inform program delivery and support evaluation. The quiz might be used, for example, to screen clients and triage them for different types of intervention based on results. It could also be used to help evaluate programs if organizations are able to administer the quiz in a pre-post design with approximately 12 months in between or where a control group can be used. For these community settings, staff may have little experience or training in administering surveys so the instrument must be simple. Further, time constraints demand an instrument that does not take a long time to administer and it should also be adaptable for conditions where respondents are self-administering the quiz. In other words, the instrument has to be short, easy to use and the results have to be easy to interpret. On this last goal – ease of interpretation – the above scales are not optimal, but an adaptation (discussed in the next section, below) may overcome that obstacle.

Theory on financial capability generally treats it as a continuous construct<sup>xxiii</sup> (in the sense that any individual will perform along a continuum between lower and higher degrees of capability) but also as construct where there is some real, underlying set of optimal financial behaviors, attitudes and knowledge. Our imperfect ability to measure the latent quality of capability means that we are constraining the continuum based on minimal and maximum observable measures. The scales above reflect that same approach since individual respondents can receive a score along a scale where the upper and lower limits of the scale remain fixed. Another approach is to instead let users evaluate their own performance in relation to the reference population – in this case the nationally-representative survey of adult Canadians. This measurement approach will instead allow a respondent to understand his or her score in relation to the population distribution.

In the pilot phase of this quiz, I was able to indicate, for each quiz item, which answer represented the median response in the national data. Respondents could then evaluate whether their score was above or below that median based on the underlying ordinal scale of the responses. In this current project, I expand substantially on that approach by using the numeric scales in Table 2 (above) to first calculate the scores (on all five domains of financial capability) for the 27,555 in the survey sample. Next I, examine the population distribution of scores to examine the shape and spread of the scores in the general adult population. While the scales offer a bounded continuum for individual performance on “Making ends meet”, “Keeping track”, “Planning ahead”, “Choosing products” and “Staying informed”, the distribution (in this case by decile) no offers a basis for individual ranking relative to the adult population. Figures 1 through 5 below show the scores corresponding to the lowest 10%, next 10% and so on for each of the five domains of financial capability. The logarithmic trend line is also included for reference. The population distribution results confirm the assumptions made in the confirmatory factor models for the underlying scales.

*Figure 1: Population scores on “Making ends meet” (MEM)*

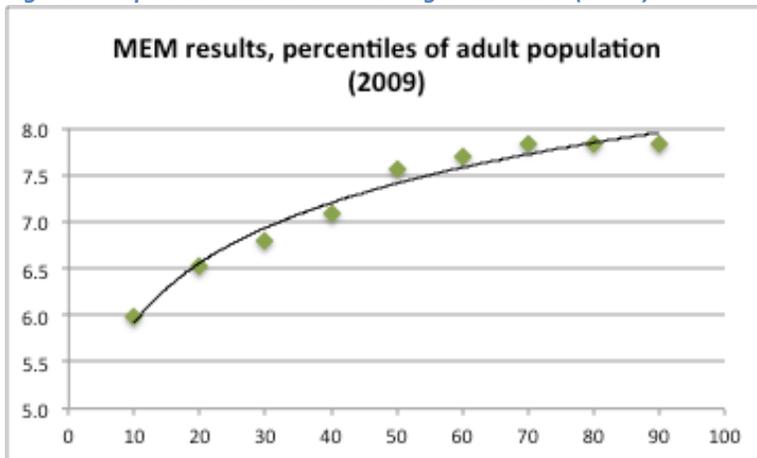


Figure 2: Population scores on "Keeping track" (KT)

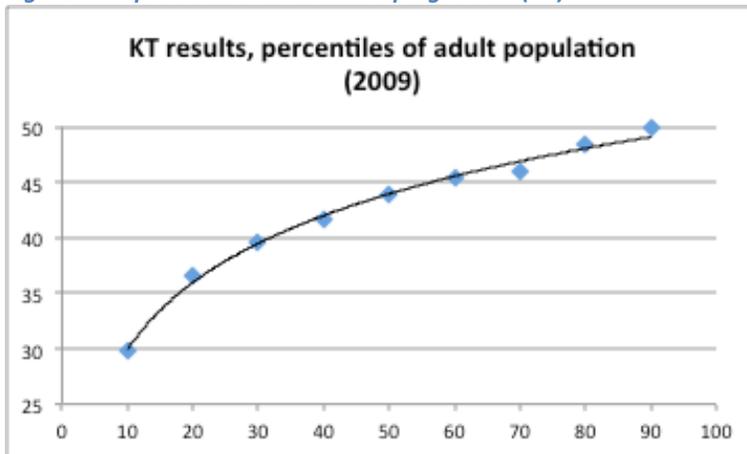


Figure 3: Population scores on "Planning ahead" (PA)

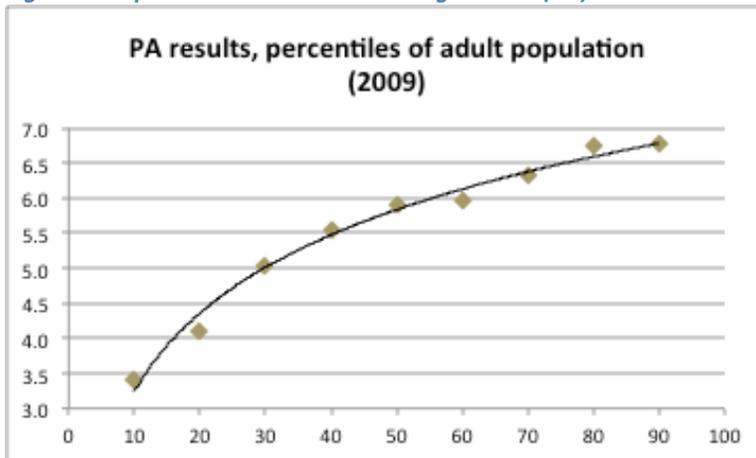


Figure 4: Population scores on "Choosing products" (CP)

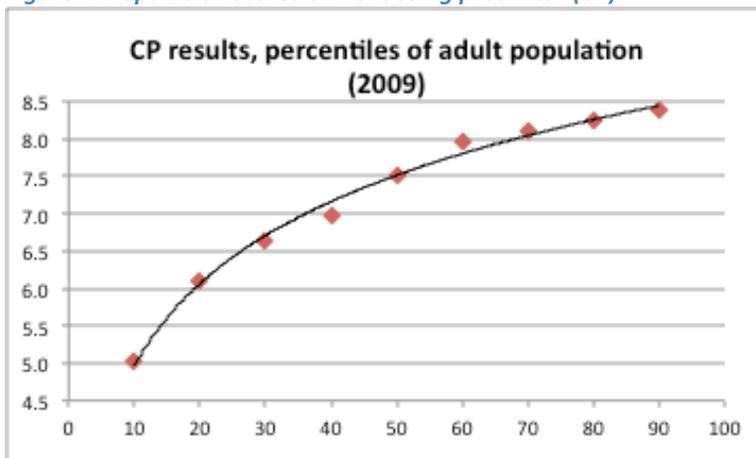
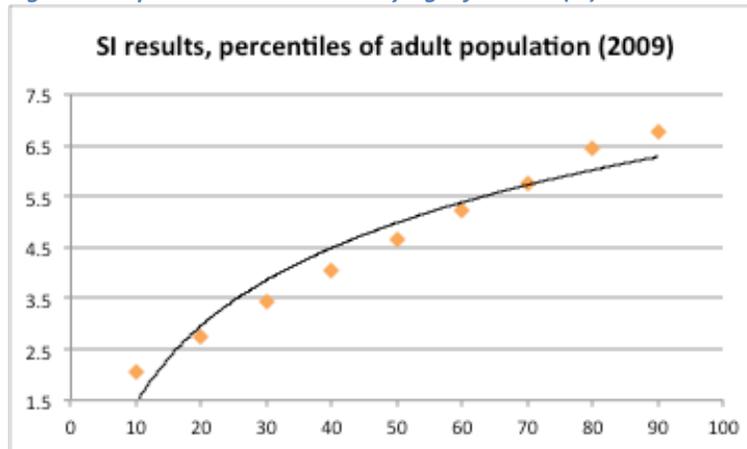


Figure 5: Population scores on “Staying informed” (SI)



These charts are also included at Tab 7 in the attached Excel workbook (Appendix 3). Tab 6 provides a table with the upper and lower limits of scores by decile. This provides a guide for converting the numeric score on each of the five scale to a relative score that tells a respondent how they performed, relative to the general population. As an analogy, the basic numerical score for a given domain of financial capability would be similar to giving a respondent their height in centimeters or inches. There is a continuous scale and all human will have a height that is non-zero but also subject to some upper limit as well. But to understand whether a respondent is “tall”, we need to compare that measurement to the distribution in the population. This latter feature is what is added by converting the numerical scores into a population decile.

Readers will note that the distribution for “Making ends meet” shows that there is no difference in scores above the 7<sup>th</sup> decile meaning that 30% of the adult population in the national survey score within .03 of the maximum score for Making ends meet. Here it is important to note that this is consistent with the findings from McKay that a strong majority of Canadians were performing well on this domain.<sup>xxiv</sup> The four other scales do not show the same bunching at the upper end.

In practical terms, users may find this quiz more informative using these decile scales rather than the numerical scales. These could be left as they are and individual results would be communicated in terms of a decile position in the population. For example, a respondent scoring 37.5 on “Keeping track” would learn that they are in the bottom 30% of the population. Alternately, the population distributions could themselves be used as a score of 1-10 for each of the domains and 1-7 for the scale on “Making ends meet”. Using the same example, the respondent’s score of 37.5 places him or her in the bottom 30% of the population and could be communicated as a score of 3 out of 10 for “Keeping track”. When the scores are used in this way, financial capability is measured in a relative way. As the population changes, individual scores would shift as well, even if their own personal financial knowledge, behavior and attitudes remained unchanged.

## Limitations

This study is the first to try to develop an instrument to measure financial capability that is based on empirical data about the adult population of interest. As such this should be treated as a test of the feasibility of this method for developing measures of financial capability. The study described above demonstrates that surveys with adequately large and representative samples can be used

to design shorter, easy to use instruments and that responses to behavioral and attitudinal questions can be scored objectively rather than by expert judgement alone.

However, there are at least four limitations to the final quiz produced in this study:

1. Some community organizations who offer financial education and counseling services may prefer an instrument that is more specific to the sub-population they work with. This quiz is based on data about the full population of Canadian adults, including but not limited to particularly at-risk sub-populations such as Aboriginal Canadians, Canadians with disabilities, newcomers to Canada and adults with low skills. The choice of questions was made to avoid exclusion of sub-populations but it is not tailored to the particular financial challenges of any one group. Instead, it is a general measurement tool for general use and interpretation against a broadly-applicable model of financial capability. The quiz is brief enough that users may want to add questions at the end if there are variables of particular interest to them.
2. Ideally, this study would have included data from both the 2009 and 2014 national survey cycles. For reasons described above, this was not feasible for this study. The available public use data is not suitable for this type of analysis but does show stability in many of the variables of interest. As the national survey is repeated, the shape of financial capability in the adult population may show movement. Future research will be needed to keep the scales up-to-date. For researchers interested in poverty, this is similar to the practice of periodically updating the baseline definition for low income. The question of when and how often to update the underlying models is a matter for debate among stakeholders.
3. Whatever the gaps or weaknesses in the original survey design and data collection, this shorter quiz will also be impacted. The questionnaire for the survey was designed in 2008 and subjected to a rigorous process of editing and validation. However, the questionnaire also reflects certain compromises or interests involved. For example, the survey questionnaire includes a lengthy section on saving for a child's education. The quiz has deliberately excluded any questions about education savings because they are not applicable to a wide range of adults who do not have dependent children. But those questions took up valuable space in the national survey that meant other questions could not be asked. For the 2014 cycle, federal officials opted to leave the questionnaire unchanged to generate comparable data. Statistics Canada's collection methods, while admirably rigorous, are also likely to under-represent some sub-populations including very low-income adults without access to their own telephone and First Nations living on reserve. This may impact the range and distribution of scores on the scales constructed in this study. However, the direction (whether inflating or depressing the true range of financial capability) is unknowable based on current research and theory.
4. Managers and funders of financial literacy programs may want to use this instrument to track changes in the financial capability of their clients. For example, an organization may want to use this brief instrument to get a baseline measurement before any services are delivered and may then want to follow-up after a financial literacy intervention<sup>3</sup> to see if scores have improved. If the scores increase significantly for the clients who receive the intervention, but not for some other comparable group, then users would conclude that the change in underlying financial capability is due to their program intervention. In principle, this would be an entirely appropriate application for this new instrument.

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<sup>3</sup> Because some quiz items ask respondents to frame their answers in relation to the past 12 months, pre-post designs will likely want to ensure a time difference of 12 months between the two collection periods.

However, in program evaluation applications, users will need strategies to minimize the chances of clients “learning” the quiz rather than changing their financial capability. This might include, for example, decisions on whether and how to give clients their personal scores and careful planning on when to administer the quiz for the second time.

## List of appendices

Appendix A: Description of changes (recodes) to the variables in the Canadian Survey of Financial Capability.

Appendix B: Results, presented as an Excel workbook.

Appendix C: Structural equation model.

## Endnotes

- <sup>i</sup> For a discussion see for example Robson, J. (2012). “The case for financial literacy”. Technical report, the Canadian Centre for Financial Literacy, Toronto.
- <sup>ii</sup> Huston, S. (2010). “Measuring Financial Literacy”. *Journal of Consumer Affairs*, 44(2), 296-316.
- <sup>iii</sup> See for example, the United States Department of Health and Human Services suite of tools for the assessment of health literacy, available online at: <http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy/index.html>
- <sup>iv</sup> OECD (2012) “PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy”. Report. OECD Publishing, Paris. Available online at: [http://www.oecd.org/pisa/pisaproducts/PISA%202012%20framework%20e-book\\_final.pdf](http://www.oecd.org/pisa/pisaproducts/PISA%202012%20framework%20e-book_final.pdf)
- <sup>v</sup> JumpStart Coalition for Personal Financial Literacy (undated). “JumpStart Coalition Survey of Personal Financial Literacy Among Students”. Webpage: <http://www.jumpstart.org/survey.html>
- <sup>vi</sup> JumpStart Coalition for Personal Financial Literacy (2008). “JumpStart Survey of High School Students”. Questionnaire.
- <sup>vii</sup> Van Rooij, M., Lusardi, A. and Alessi, R. (2012). “Financial Literacy, Retirement Planning and Household Wealth”, *The Economic Journal*, 122(May), 449-478; Lusardi, A. and Mitchell, O. (2008). “Planning and Financial Literacy: How do women fare?” *American Economic Review: Papers & Proceedings 2008*, 98(2), 413– 417; Lusardi, A. and Tufano, P. (2009). “Debt Literacy, Financial Experiences, and Overindebtedness”, Working Paper, Dartmouth College.
- <sup>viii</sup> For a detailed review see Hasting, J., Madrian, B. and Skimmyhorn, W. (2013). “Financial Literacy, Financial Education and Economic Outcomes”. *The Annual Review of Economics*, 2013(5), 347-373.
- <sup>ix</sup> This measurement problem is further complicated when the design of the questions provides confusing or misleading information. For example at least 2 items in the objective knowledge test of the Canadian Financial Capability Survey appear to have more than 1 correct response. On those questions, a participant guessing would have a .50 probability of selecting a financially literate response, whatever their actual underlying competence in managing their own personal finances.
- <sup>x</sup> For a discussion see Woodyard, A. and Robb, C. (2012). “Financial Knowledge and the Gender Gap”, *Journal of Financial Therapy*, 3(1), 1-16.
- <sup>xi</sup> Hilgert, M., Hogarth, J. and Beverly, S. (2003). “Household financial management: the connection between knowledge and behavior”, *Federal Reserve Bulletin*, 309-322.
- <sup>xii</sup> Robb, C. and Woodyard, A. (2011). “Financial Knowledge and Best Practice Behavior”, *Journal of Financial Counseling and Planning*, 22(1), 60-70.
- <sup>xiii</sup> OECD (2015) “Database of Articles and Research”, International Gateway for Financial Education. Available online at: <http://www.financial-education.org/article.php>. Search for “Financial Literacy/Capability Survey”, conducted October 1, 2015.
- <sup>xiv</sup> Atkinson, A. and F. Messy (2012). “Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study”, *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 15, OECD Publishing, Paris.
- <sup>xv</sup> Robson, J. (2011). “Piloting a personal financial literacy quiz in Canada: Results of a developmental study”. Technical report. Canadian Centre for Financial Literacy, Toronto.
- <sup>xvi</sup> McKay, S. (2011). “Understanding Financial Capability in Canada: Analysis of the Canadian Financial Capability Survey”, Report for the Task Force on Financial Literacy, Department of Finance, Ottawa.
- <sup>xvii</sup> Kempson E., S. Collard, and N. Moore. (2005). “Measuring Financial Capability: An Exploratory Study”, Technical paper. Financial Services Authority, London; Atkinson, A., S. McKay, S. Collard, and E. Kempson. (2007). “Levels of Financial Capability in the UK,” *Public Money and Management* 27(1), 29-36.
- <sup>xviii</sup> Kempson, Collard and Moore (2005).
- <sup>xix</sup> The national survey questionnaire was designed for computer-assisted telephone interviews in which skip-patterns in the order of questions could be pre-determined and interviewers might be able to repeat or offer prompts to help respondents understand questions being asked.
- <sup>xx</sup> See McKay (2011), Atkinson and Messy (2012) and Kempson (2007).

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- <sup>xxi</sup> Schmitt, T. (2011). "Current Methodological Considerations in Exploratory and Confirmatory Factor Analysis". *Journal of Psychoeducational Assessment*, 29(4), 304-321; Wirth, R. and Edwards, M. (2007). "Item Factor Analysis: Current approaches and future directions". *Psychological Methods*, 12(1), 58-79; Pasta, D. and Suhr, D. (2004). "Creating Scales from Questionnaires: PROC VARCLUS vs. Factor Analysis". Paper 205-29, SAS Users Group International Conference 29, Montreal, May 9-12.
- <sup>xxii</sup> Post-estimation Wald tests confirmed the fit of the models at  $p < 0.01$  for all five models.
- <sup>xxiii</sup> See Kempson, Collard and Moore (2005); Huston, S. (2010).
- <sup>xxiv</sup> See McKay (2011), Figure 1, page 12.