

**Statistical Literacy/Numeracy
Statistics Canada Initiatives**

IASSIST
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Today's Topics

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 - Media - The Daily, Lock-ups, Media Room
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Today's Topics (cont'd)

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- References
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 - Statistics Canada Education Outreach contact
 - Research Questionnaires – need for an online tutorial

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The Issue: Statistical Literacy/Numeracy

- A widely supported ISI initiative to improve 'numeracy' and knowledge of statistical concepts and measures
 - International Statistical Literacy Project
 - <http://www.stat.auckland.ac.nz/~iase/islp/home>
 - <http://www.stat.auckland.ac.nz/~iase/islp/def>
- Many Universities and National Statistical Offices (NSOs) including STC are linked to the site
- Almost all initiatives aimed at teachers and students and not general population
- Little is known about statistical literacy of NSO web site users
- **Question – 'Should statistics publishers/organizations focus more on ensuring the population at large can use their output?'**

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The Issue: Statistical Literacy/Numeracy (cont'd)

"...the term 'statistical literacy' refers broadly to two interrelated components, primarily (a) people's ability to interpret and critically evaluate statistical information, data-related arguments, or stochastic phenomena, which they may encounter in diverse contexts, and when relevant (b) their ability to discuss or communicate their reactions to such statistical information, such as their understanding of the meaning of the information, or their concerns regarding the acceptability of given conclusions. These capabilities and behaviors do not stand on their own but are founded on several interrelated knowledge bases and dispositions...". The knowledge elements are "literacy skills, statistical knowledge, mathematical knowledge, context knowledge, and critical questions". The dispositional elements are "belief and attitudes, and critical stance".

Gal, Iddo. Adults' Statistical Literacy: Meanings, Components, and Responsibilities. (In International Statistical Review, Volume 70, Number 1, April 2002, Pages 1 to 25)

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The Issue: Statistical Literacy/Numeracy (cont'd)

Numeracy is the mathematics for effective functioning in one's group and community, and the capacity to use these skills to further one's own development and of one's community (Beazley, 1984).

Numeracy involves abilities that include interpreting, applying and communicating mathematical information in commonly encountered situations to enable full, critical and effective participation in a wide range of life roles (Queensland Department of Education, 1994)

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Some Questions for NSOs

- How well understood are our concepts and measures by our data/site users?
- If their statistical literacy is 'low', are NSOs serving users well if they don't understand the concepts and measures they are using?
- Is it within the role of an NSO to provide this type of training?
- If not who should provide it?
- Is it an 'obligation' in an online world to have this as a feature of an NSO site?

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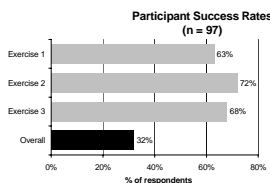
Statistical Literacy - STC's Data Users

- In the dozens of studies we've conducted we've never measured the 'statistical literacy' of our site visitors.
- Some 'proxies'
 - Canadian Statistics Usability Study – 1998: Only 32% of 97 persons tested found answers to all 3 test questions. **Almost 30% of those tested found an answer they thought was correct but it was in fact wrong.** We concluded that the navigation of the module and labelling were not intuitive but in fact it may have been that the concepts and measures were misunderstood.

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Overall Findings



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Statistical Literacy - STC's Data Users(cont'd)

- Some 'proxies' (cont'd)
 - Adult Literacy and Life Skills Survey – 1994 and 2003: The second cycle of this international study conducted in partnership with the OECD added 'numeracy' as a literacy category (See Appendix for definition and the five level grading system that was used to assess individuals' abilities).
 - The Canadian data reveal that:
 - While 58% of Canadians achieve level 3 on the prose and document scales only 50% achieve this level for numeracy- can meet most daily requirements
 - Male numeracy slightly higher than female – avg 18 points
 - 58% of college and 75% of university grads - level 3 or higher

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Five Level Numeracy Scoring Grid

- **Level 1** – Tasks in this level require the respondent to show an understanding of **basic numerical ideas** by completing simple tasks in concrete, familiar contexts where the mathematical content is explicit with little text. Tasks consist of simple, **one-step operations such as counting, sorting dates, performing simple arithmetic operations** or understanding common and simple percents such as 50%.
- **Level 2** – Tasks in this level are fairly simple and relate to identifying and **understanding basic mathematical concepts embedded in a range of familiar contexts where the mathematical content is quite explicit and visual** with few distractors. Tasks tend to include one-step or two-step processes and **estimations involving whole numbers, benchmark percents and fractions, interpreting simple graphical or spatial representations**, and performing simple measurements.
- **Level 3** – Tasks in this level require the respondent to demonstrate **understanding of mathematical information represented in a range of different forms, such as in numbers, symbols, maps, graphs, texts, and drawings.** Skills required involve number and spatial sense, knowledge of mathematical patterns and relationships and the ability to interpret proportions, data and statistics embedded in relatively simple texts where there may be distractors. Tasks commonly involve undertaking a

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Five Level Numeracy Scoring Grid

- **Level 3 (contd)** - number of processes to solve problems.
- **Level 4** – Tasks in this level require respondents to **understand a broad range of mathematical information of a more abstract nature represented in diverse ways**, including in texts of increasing complexity or in unfamiliar context. These tasks involve **undertaking multiple steps to find solutions to problems** and require more complex reasoning and interpretation skills, including comprehending and working with proportions and formulas or **offering explanations for answers.**
- **Level 5** – Tasks in this level require respondents to **understand complex representations and abstract and formal mathematical and statistical ideas**, possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information, draw inferences, or generate mathematical justification for answers.

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Statistical Literacy - STC's Data Users(cont'd)

- Only 40% of recent and established immigrants - level 3 or higher
- Significant difference in scores between employed and unemployed
- Very low numeracy skills over level 3 for seniors and aboriginals
- 65% – 85% of knowledge experts, managers, information workers over level 3. Less than 50% of services and goods occupations above level 3.
- Lower scores less likely to receive adult education and lower social engagement
- Demand for higher numeracy increasing with more knowledge based economy
- Lower literacy scores – lower level of social engagement

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Current Initiatives

- The Daily
 - Summary analysis of all new data releases for the news media and the 'general data user'. The Daily is released at 8:30 AM EST except for Labour Force and Consumer Price Index releases at 7:00. The Daily is distributed by list serve or RSS feed - in its entirety or by one or more of 32 topics -to 16,000 recipients. Content of The Daily and other public good data from www.statcan.ca can be republished as long as Statistics Canada is cited as the source and the date of the data release.

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Current Initiatives (cont'd)

- If the information is republished on the internet a link to www.statcan.ca is also required so that users may have access to the full range of data STC has published on a topic as well as access to information to help interpret the data.
- Approximately 20,000 pages linked to www.statcan.ca and approximately 25% of web site traffic comes from links

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Current Initiatives (cont'd)

- Meta Data – Definitions, Data Sources and Methods
 - Accessible from left hand toolbar and from The Daily, Summary Tables, CANSIM, Census etc.
 - <http://www.statcan.ca/menu-en.htm>
 - <http://www.statcan.ca/english/concepts/index.htm>
 - <http://www12.statcan.ca/english/census/index.cfm>
- Media - The Daily, Lock-ups for Major Releases, Media Room
 - Statistics Canada serves most Canadians with information on the country's economic and social conditions via the news media. The Agency attempts to maximize exposure of its data to the general public and key user communities through public media. Media reports typically add value with commentary by experts, identify future implications of current data and integrate with other information sources.

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ECONOMY Growth seen climbing out of a trough GDP expected to rebound from 4th quarter

TAVIA GRANT Economists are viewing Canada's fourth-quarter economic performance -- the worst showing in three years -- as a trough, with gross domestic product now heading up. "We got a pretty good handoff for the first quarter," Marc Levesque, chief economics strategist at Toronto-Dominion Bank, said yesterday. He sees growth bouncing back to about 3 per cent in the current quarter. The gross domestic product rose at a 1.4-per-cent annual pace in the fourth quarter as business inventories buckled. Statistics Canada said. It was the slowest pace since the middle of 2003, when the economy was grappling with SARS and an outbreak of mad-cow disease. That said, a marked pickup in December bodes well for growth at the start of this year. The economy expanded 0.4 per cent in December on a monthly basis, helped by consumer spending, from 0.3 per cent in November and just 0.1 per cent in October. Yesterday's report cemented expectations the Bank of Canada will keep its key lending rate on hold Tuesday, with growth still showing no sign of spurring inflation. The murky area remains the U.S. economy. While some think Canadian growth will gather steam, especially in the second half of this year, all bets are off if the U.S. gets walloped by a weakening housing market, falling equity markets or a drop in consumer and business spending. For now though, the picture here appears to be brightening. Fourth-quarter growth was boosted by the services side of the economy, particularly in financial services, restaurants and accommodation and air travel. The automotive product sector also helped, adding to consumer spending and exports.

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Current Initiatives (cont'd)

- Media - The Daily, Lock-ups for Major Releases, Media Room (cont'd)
 - Lock-ups for major releases (160 per year) allow journalists to file stories at the official release time and plan their research to add value to our report. The 2006 Census lock-up actually began at midnight for an 8:00 am release. The information package included The Daily release and analysis at provincial, major municipality and urban/rural levels. <http://www12.statcan.ca/english/census/index.cfm>
 - The Media Room was created as a resource for news media but is widely used by other users as well. http://www42.statcan.ca/smr_r000_e.htm The content assists reporters to develop national and local stories, do comparisons, (ridings, cities, provinces, international) and analyze trends.

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Current Initiatives (cont'd)

- Education - Data Liberation Initiative, Education Outreach
 - STC's major effort to enhance statistical literacy among the population at large have focused on initiatives with educators and students. Exposure to and use of statistics at school builds the base for lifelong learning in relation to numeracy and develop citizens who know how to effectively use data and know the value of participating in our surveys.
 - <http://www.statcan.ca/start.html> - Learning Resources
 - Key activities include: content that can be integrated with curricula for all provinces and territories, lesson plans developed by teachers on fundamental data concepts; access to E-STAT, STC's data warehouse for social, economic and Census data – access to articles, mapping and graphing; content in textbooks; Power from Data – a primer on surveys; and Census at School

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Current Initiatives (cont'd)

- Education - Data Liberation Initiative, Education Outreach
 - Data Liberation Initiative launched in 1996
 - Provides university teachers and students with free access to all STC electronic data files – micro data, geography, Census etc
 - Objective is to support research and teaching
 - Now includes almost all universities and participation by colleges is growing quickly – 71 institutions
 - A strong community of interest has evolved – a network that provides support and training
 - In 2005 over 90,000 files were downloaded from the DLI server, over 33,000 already by April '07

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Current Initiatives (cont'd)

- Courses on Data Methods – The Workshop Series of courses on survey methodology is offered at Statistics Canada Regional Offices throughout the country.
<http://www.statcan.ca/english/services/workshops.htm>
- Analytical Studies - Statistics Canada is a world leader in research. Our studies and research papers cover a wide range of topics dedicated to helping Canadians know more about their social, commercial, financial and economic situation. The studies appear as individual publications or as articles in publications such as Canadian Social Trends, Canadian Economic Observer, Health Reports, Perspectives on Labour and Income and in the Overview section of the Summary Tables module – formerly the Canada Year Book.
<http://www.statcan.ca/menu-en.htm>

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Upcoming Activities

- Strategic Discussion - Should Statistics Canada develop a 'module' or 'features' for its web site that provides eLearning for our site users? The materials would provide users with the tools to understand the statistical measures and concepts used in the Agency's published information.
- User Research - Annual Site Survey, Email Survey
- Online Tutorial - National Accounts

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Question on annual survey of site users

- Interest in an online tutorial in statistics
 - The next section is intended to determine your interest in using a free online statistical tutorial that is being considered as part of a future enhancement of the Statistics Canada website.
 - The tutorial would include:
 - Information on statistical concepts, such as mean, median, mode, margin of error, etc.;
 - Information on some of the measures Statistics Canada publishes on its website e.g. Gross Domestic Product, Unemployment Rate, and Consumer Price Index;
 - Information to help you improve your skills in analysing data, and in using data to create tables, charts, and graphs; and
 - An evaluation of your knowledge on these topics.
 - 17. Would you be interested in using such a tutorial?
 - o Yes
 - o No
 - o Don't know

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User Research – Online Tutorial (cont'd)

- 996 respondents – 45% - indicated an interest in a tutorial
 - 30% researchers, analysts, librarians, economists, social scientist
 - 15% College or University Students
 - 13% management
- Follow-up email survey
 - Concepts, techniques to display data, key indicators, sampling methods, major statistical programs, glossary of terms with links, exercises on how to use data, top 3 data sets, assessment tool, top priorities, level of knowledge, occupation, sector

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National Accounts – Online Tutorial

- Goal is to develop a plain language, easy to understand and follow and engaging tutorial for college and university students for SNA
- Conceptual model with embedded links
- Graphic to build the Accounts through a series of progressive images
- Case studies and scenarios on use of SNA data to understand value, applications and limitations
- ‘self test’ assessment tool to assess level of understanding

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Links and Resources

- Mary Townsend email, phone, paper and presentation on Education Outreach
- Adult Literacy and Learning Survey epub
 - <http://www.statcan.ca/bsolc/english/bsolc?catno=89-552-M>
 - <http://www.statcan.ca/bsolc/english/bsolc?catno=89-617-X>
 - <http://www.statcan.ca/bsolc/english/bsolc?catno=89-603-X>
- Market Research Questionnaire
- david.roy@statcan.ca (613) 951-1116

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Numeracy Definitions ALLS

- *Numeracy is the knowledge and skills required to effectively manage and respond to the mathematical demands of diverse situations.*
- *Numeracy is the mathematics for effective functioning in one's group and community and the capacity to use these skills to further one's own development and of one's community (Beazley, 1984)*
- *Numeracy involves abilities that include interpreting, applying and communication mathematical information in commonly encountered situations to enable full, critical and effective participation in a wide range of life roles. (Queensland Department of Education, 1994)*

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Numeracy Definitions (cont'd)

- *To be numerate is more than being able to manipulate numbers or even being able to succeed in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real-world, with all its diversity. (Johnston, 1994)*
- *Numerate behaviour is observed when people manage a situation or solve a problem in a real context, it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge factors and processes*

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