

## Maternal serum screening in Newfoundland and Labrador

*Do attitude and knowledge affect physicians' practice?*

Jonathan Cavanagh, MSc Maria Mathews, PhD

### ABSTRACT

**OBJECTIVE** To examine family physicians' practice of, attitudes toward, and knowledge about maternal serum screening (MSS) and to compare the demographic and practice characteristics, attitudes, and knowledge of physicians who offer MSS to all their pregnant patients with those of physicians who offer MSS to some or none of their pregnant patients.

**DESIGN** Cross-sectional mailed survey.

**SETTING** Newfoundland and Labrador.

**PARTICIPANTS** One hundred eighty-two family physicians who provided prenatal care.

**MAIN OUTCOME MEASURES** Proportion of physicians offering MSS to their pregnant patients. Sociodemographic characteristics and attitudes toward and knowledge about MSS of physicians who offer MSS to all, some, or none of their pregnant patients.

**RESULTS** Just over half the physicians (52.2%) offered MSS to all their pregnant patients, 34.6% offered it to some patients, and 13.2% did not offer MSS at all. Almost two thirds of physicians (63.6%) had not changed their practice regarding MSS in the past 18 months, but 29.5% said they offered MSS more often. About 69.6% of physicians communicated positive results to patients within 48 hours; 60.8% communicated negative results at the next clinical appointment. Half (50.6%) believed that offering MSS did not affect their legal risk, 24.1% said it increased their risk, and 25.3% said it decreased their risk. Most physicians (83.4%) ordered MSS at the correct gestational age. A larger proportion of those who offered MSS to all patients were female, were between 30 and 39 years old, had graduated from Canadian medical schools, practised in urban centres, and were aware of the provincial MSS program. Physicians who offered MSS to all, some, or none of their patients were similar in terms of length of practice in Canada, whether they performed deliveries, number of pregnant women they cared for annually, beliefs about MSS and legal risk, and general knowledge of MSS detection rates.

**CONCLUSION** More than half the family physicians in Newfoundland and Labrador offered MSS to all their pregnant patients, and another third offered it to some patients. Physicians' practice was not related to their attitudes toward or knowledge about MSS.

### EDITOR'S KEY POINTS

- This survey examines how often family physicians offered maternal serum screening (MSS) to their patients in 2003 in Newfoundland and Labrador.
- About 52% of family physicians offered MSS to all their pregnant patients, 35% offered it to some, and 13% did not offer it all. Overall, this was a 23% increase over their rates of offering it in 2000.
- Women physicians, those between 30 and 39 years old, graduates of Canadian medical schools, urban physicians, and those aware of the provincial MSS program offered MSS more often.
- Despite the increase in rates of offering MSS, only 22% of pregnant patients took the test compared with 48% in Ontario. This could reflect a different value system regarding the test.

This article has been peer reviewed.

Full text available in English at [www.cfpc.ca/cfp](http://www.cfpc.ca/cfp)

*Can Fam Physician* 2006;52:1268-1269.

## METHODS

**M**aternal serum screening (MSS), a prenatal test that is done during the second trimester, determines a woman's risk of carrying a fetus with Down syndrome, trisomy 18, or an open neural tube defect. Doing the test regardless of a woman's age or medical history means that invasive diagnostic tests, such as amniocentesis, can be offered more selectively to those with positive results of screening and that rates of detecting problems can be increased substantially.<sup>1</sup>

The Canadian Task Force on the Periodic Health Examination<sup>2</sup> and the Society of Obstetricians and Gynaecologists of Canada<sup>3</sup> indicate there is fair evidence for offering MSS to all pregnant women. The Provincial Medical Genetics Program of Newfoundland and Labrador (NL) introduced the MSS program at the beginning of 2002. Such screening should be of particular interest to the people of NL because, when the program was introduced, NL had the highest incidence of neural tube defects in Canada (4/1000 births).<sup>4</sup>

A 2000 survey had found that 47% of general practitioners, family physicians, and obstetricians in NL offered MSS to all pregnant women and another 37% discussed MSS with some women.<sup>5</sup> In comparison, 87% of family physicians in Ontario offered MSS to all pregnant women.<sup>6</sup>

Physicians' use of MSS is related to sex of physician, volume of deliveries, and (in some provinces) size of community. For example, previous studies have found that more women than men physicians and more physicians who performed a large number of deliveries than those who performed few offered MSS to all patients.<sup>5-7</sup> Studies in Manitoba and Ontario found that a larger proportion of urban physicians than rural physicians offered MSS to all patients,<sup>7,8</sup> but a previous study in NL had not found this difference.<sup>5</sup> These studies also reported that up to 30% of tests were not ordered during the correct time. Although surveys of physicians have found that they know little about MSS (such as detection rates and false-positive rates),<sup>5,6</sup> these surveys did not examine the relationship between physicians' use of MSS and their attitudes toward or knowledge about it. As MSS is the first prenatal genetic screening program in NL, understanding what fosters and impedes its recommended use might assist in implementation of other population-based screening tests in Canada.<sup>9</sup>

This study examines MSS use and attitudes toward and knowledge about MSS among family physicians in NL. It compares the demographic and practice characteristics, attitudes, and knowledge of physicians who offered MSS to all their pregnant patients with those of physicians who offered it to only some of their patients or to none at all.

**Mr Cavanagh** teaches in the Faculty of Medicine at Memorial University of Newfoundland in St John's.

**Dr Mathews** teaches in the Division of Community Health at Memorial University of Newfoundland.

The Human Investigation Committee of the Faculty of Medicine at Memorial University of Newfoundland in St John's approved this study. We surveyed all 490 family physicians practising in NL based on a list of eligible physicians taken from the mailing list of the NL Medical Board. Physicians who had not provided prenatal care in the previous year were excluded from the study.

We surveyed physicians between September 23, 2003, and November 13, 2003. To promote a higher response rate, we sent out 3 reminder surveys. The third follow-up survey was hand-delivered to the offices of physicians practising within 1 hour of St John's; physicians in the rest of NL were contacted by telephone.

For this survey, we adapted the questionnaire used by Carroll et al<sup>6</sup> to assess the Ontario MSS program. We shortened the survey and altered some of the questions to better represent the MSS program in NL. The survey was pretested on medical students, graduate students, faculty, genetic counselors, and physicians.

We gathered information on physicians' sociodemographic characteristics (age, sex, medical school), practice characteristics (community size, years in practice in Canada, number of deliveries performed each year, number of years of providing prenatal care, and number of pregnant women cared for each year), MSS practice (MSS offered to all, some, or no patients; change in MSS practice during last 18 months; and turnaround time for notifying patients of results). The survey also asked about attitudes toward MSS (whether MSS could mislead patients into believing physicians could guarantee healthy babies, whether a first-trimester screening was preferable, and opinions about MSS and legal risk), and knowledge about MSS (awareness of the provincial MSS program, correct time for offering MSS, false-positive and true-positive rates for each genetic disease screened). In an open-ended question, physicians who did not offer MSS to their patients were asked why.

Survey data were analyzed using the Statistical Package for the Social Sciences, version 11.5. For the questions involving knowledge of MSS regarding detection and false-positive rates, physicians who were within 5% of the correct value were considered to have chosen the "correct" rate.

Frequencies were used to describe the characteristics of the sample as a whole. Chi-square and *t* tests were used to identify differences between physicians who offered MSS to all patients, some patients, or no patients. Level of significance was set at <.05. Because all family physicians in the province were sampled, we did not calculate sample size. Frequencies were used to analyze responses from categorized open-ended questions, such as those asking about reasons for not offering MSS.

**Table 1. Characteristics of respondents: N = 182.**

RESPONDENT CHARACTERISTICS	N (%)
Sex	
• Male	101 (56.1)
• Female	79 (43.9)
Age (y)	
• <30	12 (6.6)
• 30-39	50 (27.6)
• 40-49	62 (34.3)
• 50-59	48 (26.5)
• 60 or older	9 (5.0)
Medical school	
• In Canada	134 (73.6)
• Outside Canada	48 (26.4)
Practice location	
• Urban	79 (44.6)
• Semiurban	20 (11.3)
• Rural	78 (44.0)
Perform deliveries	
• No	155 (85.2)
• Yes	27 (14.8)

\*Not all physicians answered all questions. Percentages are based on number responding.

**Table 2. Characteristics of respondents' practices: N = 182.**

PRACTICE CHARACTERISTICS	MEAN (STANDARD DEVIATION)
No. of years practising in Canada	16.5 (11.2)
No. of deliveries each year	40.3 (35.8)
No. of years providing prenatal care	16.0 (10.0)
No. of pregnant women cared for each year	25.4 (25.9)

## RESULTS

Among the 490 physicians on the NL Medical Board mailing list, 35 had retired or moved. Of the remaining 455 physicians, 270 responded to the survey for a response rate of 59.3%. Eighty-eight respondents had not provided prenatal care during the previous 12 months and were excluded from the study. This paper reports on the remaining 182 physicians.

To assess the representativeness of our sample, we compared the sex, specialty, and location of practice of respondents with those of physicians on the list provided by the NL Medical Board. We found no significant differences between respondents and nonrespondents.

**Table 1** presents characteristics of the physicians in the study and **Table 2** characteristics of how they

practise. There were more men than women. The largest proportion of respondents (34.3%) were 40 to 49 years old, and 73.6% had graduated from Canadian medical schools. Almost equal proportions of physicians practised in rural and urban settings.

Most respondents (86.8%) offered MSS (52.2% to all and 34.6% to some of their pregnant patients); 13.2% did not offer it (**Table 3**). About 63.6% of physicians had not changed their practice regarding MSS during the past 18

**Table 3. Practice regarding, attitudes toward, and knowledge about MSS**

PHYSICIANS' USE OF MSS	N (%)*
Practice	
• Offer MSS to all patients	95 (52.2)
• Offer MSS to some patients	63 (34.6)
• Do not offer MSS	24 (13.2)
• Offered MSS more often during last 18 months	51 (29.5)
• Offered MSS less often during last 18 months	5 (2.9)
• No change in offering MSS during last 18 months	110 (63.6)
• Not sure how much MSS offered during last 18 months	7 (4.0)
Attitudes	
• Offering MSS increases legal risk	41 (24.1)
• Offering MSS decreases legal risk	43 (25.3)
• Offering MSS does not affect legal risk	86 (50.6)
• Screening leads patients to believe physicians can guarantee healthy babies	54 (33.1)
• Prefer screening during first trimester	114 (70.8)
Knowledge	
• Aware of provincial MSS program	135 (80.4)
• Knew correct false-positive rate	54 (42.5)
• Knew correct detection rate for Down syndrome	23 (17.8)
• Knew correct detection rate for open neural tube defects	53 (40.5)
• Knew correct detection rate for trisomy 18	44 (36.7)

MSS—maternal serum screening.

\*Not all physicians answered all questions. Percentages are based on number responding.

months; 29.5% said they offered MSS more often. Half of the physicians believed that MSS did not affect their legal risk; one quarter thought it decreased their risk; and one quarter thought it increased their risk. One third of physicians believed that MSS misled patients into believing that physicians could guarantee healthy babies, and more than two thirds said they preferred screening during the first trimester rather than the second trimester. Most physicians (80.4%) were aware of the provincial MSS program, but only 42.5% knew the correct false-positive rate of the test. Few knew the correct detection rates of the test for Down syndrome (17.8%), open neural tube defects (40.5%), and trisomy 18 (36.7%).

Physicians who offered MSS to only some patients targeted women older than 35, women with a family history of Down syndrome or neural tube defects, and women who requested MSS (Table 4). Most physicians offering MSS (to either some or all of their patients) ordered the test at the correct gestational age, communicated positive results to patients within 48 hours, and communicated

negative results at the next clinical appointment.

Table 5 compares the sociodemographic characteristics and attitudes toward and knowledge about MSS of physicians who offered MSS to all, some, or no patients. Table 6 compares physicians' practice characteristics. Compared with physicians who offered MSS to some or no patients, a larger proportion of those who offered MSS to all patients were female, were between 30 and 39 years old, had graduated from a Canadian medical school, practised in urban settings, and had been providing prenatal care longer. A larger proportion of physicians who offered MSS to all patients, offered it more often than they had 18 months earlier, while the largest proportion of those who offered MSS to some or no patients had not changed their practice patterns regarding MSS during the previous 18 months. More than 90% of physicians who offered MSS to all patients were aware of the provincial MSS program; only 79.7% of physicians who offered MSS to some patients and 33.3% of physicians who did not offer MSS at all were aware of it. Compared with those who offered MSS to all or some patients, a larger proportion of physicians who did not offer MSS knew the correct detection rates of the test for Down syndrome and trisomy 18.

There were no differences between groups in terms of how long they had been practising in Canada, whether they performed deliveries or the number of deliveries they performed each year, the number of pregnant women they cared for annually, their attitudes toward MSS, or their knowledge of the test's false-positive rate or detection rates for open neural tube defects or trisomy 18. The most common reason for not offering MSS to patients was that physicians were unaware that the test was available, that it created undue anxiety among patients, and that follow-up was difficult to coordinate (Table 7).

**Table 4. Practices regarding MSS of physicians who offer it to all or some of their pregnant patients**

PRACTICES	N (%)*
Physicians who offer MSS to some patients	
• Offer MSS to women 35 or older	58 (36.1)
• Offer MSS to women younger than 35	10 (6.3)
• Offer MSS to women with a family history of Down syndrome or neural tube defects	58 (36.7)
• Screen women who ask to be tested	42 (28.5)
Physicians who offer MSS to some or all patients	
• Ordered MSS at the correct gestational age	121 (83.4)
• Communicated positive results to patients within 48 h	110 (69.6)
• Communicated positive results to patients within 1 wk	26 (16.5)
• Communicated positive results to patients within 2 wk	7 (4.4)
• Communicated positive results to patients at next clinical appointment	5 (3.2)
• Communicated negative results to patients within 48 h	21 (13.7)
• Communicated negative results to patients within 1 wk	24 (15.2)
• Communicated negative results to patients within 2 wk	11 (7.0)
• Communicated negative results to patients at next clinical appointment	96 (60.8)

MSS—maternal serum screening.

\*Not all physicians answered all questions. Percentages are based on number responding; percentages add to more than 100% because physicians could give more than 1 response.

## DISCUSSION

In 2003, 86.8% of family physicians surveyed were offering MSS to their patients. This represents an increase of 23.2% since 2000, when the proportion of family physicians offering MSS to their patients was 29%.<sup>5</sup> Despite this increase, use of the test remains low; the NL provincial laboratory reported that only 22% of pregnant women were having MSS.<sup>9</sup> In contrast, 48% of all pregnant women in Ontario were having MSS.<sup>10</sup> These findings suggest that women in NL are reluctant to have the test and highlight the need to better understand what influences women's decisions to have MSS.

A qualitative study of Ontario mothers found that women identified 3 global areas (personal values, social support, and quality of health information) that influence the decision to have MSS.<sup>11</sup> A Dutch study<sup>12</sup> found that the most common reasons for women not

**Table 5. Characteristics of physicians who offered MSS to all, some, or none of their patients**

RESPONDENT CHARACTERISTICS	OFFERED MSS TO ALL PATIENTS N = 95 N (%)	OFFERED MSS TO SOME PATIENTS N = 63 N (%)	DID NOT OFFER MSS N = 24 N (%)	PVALUE
<b>SOCIODEMOGRAPHIC CHARACTERISTICS</b>				
Sex				0
• Male	39 (41.5)	39 (62.9)	23 (95.8)	
• Female	55 (58.5)	13 (37.1)	1 (4.2)	
Age (y)				.048
• <30	3 (3.2)	7 (11.1)	2 (8.3)	
• 30-39	38 (40.4)	8 (12.7)	4 (16.7)	
• 40-49	26 (27.7)	31 (49.2)	5 (20.8)	
• 50-59	23 (24.5)	16 (25.4)	9 (37.5)	
• 60 or older	4 (4.3)	1 (1.6)	4 (16.7)	
Medical school				0
• In Canada	81 (85.3)	41 (65.1)	12 (50.0)	
• Outside Canada	14 (14.7)	22 (34.9)	12 (50.0)	
<b>PRACTICE CHARACTERISTICS</b>				
Location				.046
• Urban	47 (50.5)	23 (37.7)	9 (39.1)	
• Semiurban	11 (11.8)	9 (14.8)	0	
• Rural	35 (37.6)	29 (47.5)	14 (60.9)	
Perform deliveries				.309
• No	80 (84.2)	52 (82.5)	23 (95.8)	
• Yes	15 (15.8)	11 (17.5)	1 (4.2)	
<b>MSS PRACTICE DURING PAST 18 MO</b>				
Offered MSS more	32 (13.1)	14 (23.0)	0	.026
Offered MSS less	14 (13.6)	4 (6.6)	0	
No change	57 (55.3)	40 (65.6)	19 (86.4)	
Not sure	0	3 (4.9)	3 (13.6)	
<b>ATTITUDES TO MSS</b>				
Offering MSS increases legal risk	23 (24.8)	13 (21.0)	5 (26.3)	.943
Offering MSS decreases legal risk	19 (21.3)	21 (23.9)	3 (15.8)	
Offering MSS does not affect legal risk	47 (52.8)	28 (45.2)	11 (57.9)	
Screening leads patients to believe physicians can guarantee healthy babies	22 (25.9)	23 (38.3)	9 (50.0)	.132
Prefer screening during first trimester	57 (68.7)	40 (70.2)	17 (81.0)	.725
<b>KNOWLEDGE OF MSS</b>				
Aware of provincial MSS program	81 (92.0)	47 (79.7)	7 (33.3)	
Knew correct false-positive rate	28 (38.4)	17 (41.5)	7 (53.8)	.576
Knew correct detection rate for Down syndrome	11 (16.2)	6 (12.5)	6 (46.2)	.017
Knew correct detection rate for open neural tube defects	31 (45.6)	17 (34.0)	5 (35.7)	.419
Knew correct detection rate for trisomy 18	29 (43.9)	9 (21.4)	6 (50.0)	.036

MSS—maternal serum screening.



**Table 6. Practice characteristics and physicians' offers of MSS**

PRACTICE CHARACTERISTICS	OFFERED MSS TO ALL PATIENTS MEAN (SD)	OFFERED MSS TO SOME PATIENTS MEAN (SD)	DID NOT OFFER MSS MEAN (SD)	P VALUE
No. of years practising in Canada	14.3 (10.1)	15.9 (10.0)	19.8 (13.5)	.162
No. of deliveries each year	42.3 (40.9)	41.2 (28.7)	1	.345
No. of years providing prenatal care	29.3 (26.2)	24.6 (28.1)	11.7 (7.8)	.016
No. of pregnant women cared for each year	14.4 (9.9)	17.0 (9.0)	19.9 (12.0)	.094

MSS—maternal serum screening, SD—standard deviation.

**Table 7. Reasons for not offering maternal serum screening: N = 24.**

REASON	N (%)*
Unaware screening was available	14 (58.3)
Creates undue anxiety in patients	6 (25.0)
Follow-up is difficult to coordinate	3 (12.5)
Too many false-positive results	1 (4.2)
Too difficult to explain test and outcomes	1 (4.2)

\*Adds to more than 100% because physicians could give more than 1 response.

to have MSS or nuchal translucency (a screening test for chromosomal abnormalities) were because the results of the tests were uncertain and unreliable, the women were not at high risk, and the women would not abort a fetus anyway. The most common reasons for having the tests were because women wanted to know about the health of their babies, the tests did not involve risk, and the women were at increased risk of having children with Down syndrome. We were unable to find Canadian studies that described women's reasons for choosing to have or not have MSS. Our current research examines these reasons and looks at women's knowledge of MSS and where they get their information.

More than one third of physicians in the study offered MSS to some patients, such as women older than 35; women with a family history of Down syndrome, open neural tube defects, or trisomy 18; and women who requested MSS. Maternal serum screening is intended to be population-based screening, and risk rates are calculated by comparing analyzed biochemical marker levels with levels typically seen in the general population.<sup>6</sup> Hence, it is inappropriate to recommend MSS solely to women in high-risk groups.

Most physicians surveyed (70.8%) said they preferred a first-trimester screening test. Some larger Canadian centres use a combination of first- and second-trimester screening to increase sensitivity and specificity rates. The first-trimester test is not currently available in NL, however. Introduction of a first-trimester test might improve rates of MSS in NL.


Almost 13% of family physicians were not offering MSS to their patients. Slightly more than half those

physicians (58.3%) reported that they were unaware the screening test was available in NL. The number of physicians ordering MSS at the correct gestational age had increased; in 2003, 83.4% of physicians ordered MSS between the 15th and 20th gestational week compared with 70.0% in 2000.<sup>5</sup> General knowledge about MSS remained low, however, underscoring the need for ongoing education about MSS. Our findings also suggest that physicians' practice regarding MSS was not related to their specific knowledge about the test's qualities. It will be important to assess whether scanty knowledge about MSS affects the quality of counseling given to patients and patients' willingness to be screened.

### Limitations

This study is limited by the self-reported nature of the data. Physicians who were familiar with MSS or who practised evidence-based medicine might have been more likely to respond to the survey. Respondents might have given socially acceptable responses rather than reporting their actual practices or opinions.

### Conclusion

More than half the family physicians in NL offered MSS to all their pregnant patients. An additional third offered it selectively to some of their patients. Physicians' practice regarding MSS was not generally related to their attitudes toward or knowledge about MSS. 

### Contributors

**Mr Cavanagh and Dr Mathews** contributed to concept and design of the study, data analysis and interpretation, and preparing the article for submission.

### Competing interests

None declared

**Correspondence to: Jonathan Cavanagh**, c/o Division of Community Health, Memorial University of Newfoundland, Health Science Centre, St John's, NL A1B 3V6

### References

1. Wald NJ, Cuckle HS, Densem JW, Nanchahal K, Royston P, Chard T, et al. Maternal serum screening for Down's syndrome in early pregnancy. *BMJ* 1988;297:883-7.

- Canadian Task Force on the Periodic Health Examination. Periodic Health Examination (CTFPHE), 1994 update. 3. Primary and secondary prevention of neural tube defects. *CMAJ* 1994;151:159-66.
- Society of Obstetricians and Gynaecologists of Canada. Committee opinion number 79. Prenatal genetic screening for Down syndrome and open neural tube defects using maternal serum markers screening. *J SOGC* 1999;21:887-91.
- Crane J, Sun C, Hutchens D, Crowley M. The epidemiology of neural tubes defects in Newfoundland and Labrador. *J SOGC* 2001;23:510-4.
- Chandra S, Crane J, Hutchinson D, Bennett K, O'Grady T, Duff A. Maternal serum screening: practice patterns of physicians in Newfoundland. *J SOGC* 2003;25:825-9.
- Carroll JC, Reid AJ, Woodward CA, Permaul-Woods JA, Domb S, Ryan G, et al. Ontario Maternal Serum Screening Program: practices, knowledge and opinions of health care providers. *CMAJ* 1997;156:775-84.
- Permaul-Woods JA, Carroll JC, Reid AJ, Woodward CA, Ryan G, Domb S, et al. Going the distance: the influence of practice location on the Ontario Maternal Serum Screening Program. *CMAJ* 1999;161:381-5.
- Chodriker BN, Evans JA. Maternal serum AFP screening programs: the Manitoba experience. In: *Royal Commission on New Reproductive Technologies. Current practice of prenatal diagnosis in Canada. Vol 13. Research studies.* Ottawa, Ont: Royal Commission on New Reproductive Technologies; 1993. p. 535-610.
- Newfoundland and Labrador Medical Genetics Program. *Newfoundland and Labrador MSS 2003 Program Statistics.* St John's, Nfld: Newfoundland and Labrador Medical Genetics Program; 2003.
- Summers AM, Farrell SA, Huang T, Meier C, Wyatt PR. Maternal serum screening in Ontario using the triple marker test. *J Med Screen* 2003;10(3):107-11.
- Carroll JC, Brown JB, Reid AJ, Pugh P. Women's experience of maternal serum screening. *Can Fam Physician* 2000;46:614-20.
- Van den Berg M, Timmermans DR, Kleinveld JH, Garcia E, van Vugt JM, van der Wal G. Accepting or declining the offer of prenatal screening for congenital defects: uptake and women's reasons. *Prenat Diagn* 2005;25:84-90.

