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# Transforming health professional education through social accountability: Canada's Northern Ontario School of Medicine

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## Abstract

**Background**: The Northern Ontario School of Medicine (NOSM) has a social accountability mandate to contribute to improving the health of the people and communities of Northern Ontario. NOSM recruits students from Northern Ontario or similar backgrounds and provides Distributed Community Engaged Learning in over 70 clinical and community settings located in the region, a vast underserved rural part of Canada.

**Methods**: NOSM and the Centre for Rural and Northern Health Research (CRaNHR) used mixed methods studies to track NOSM medical learners and dietetic interns, and to assess the socioeconomic impact of NOSM.

**Results**: Ninety-one percent of all MD students come from Northern Ontario with substantial inclusion of Aboriginal (7%) and Francophone (22%) students. Sixty-one percent of MD graduates have chosen family practice (predominantly rural) training. The socioeconomic impact of NOSM included new economic activity, more than double the School's budget; enhanced retention and recruitment for the universities and hospital/health services; and a sense of empowerment among community participants attributable in large part to NOSM.

**Discussion**: There are signs that NOSM is successful in graduating health professionals who have the skills and desire to practice in rural/remote communities and that NOSM is having a largely positive socioeconomic impact on Northern Ontario.

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## Introduction

Northern Ontario is geographically vast (>800,000 km$^2$) with a volatile resource-based economy and socioeconomic characteristics that differ from the southern part of the province of Ontario. Forty percent of the population of Northern Ontario live in rural and remote areas where there are diverse communities and cultural groups, most notably Aboriginal and Francophone peoples. These are minority groups in the rest of Ontario, but comprise a substantial proportion of the population in the north. The health status of people in the region is worse than the province as a whole (Rural and Northern Health Care Panel 2010), and there is a chronic shortage of doctors and other health professionals (Rural and Northern Health Care Panel 2010; Glazier et al. 2011).

Recognizing that medical graduates who have grown up in rural areas are more likely to practice in rural settings (Chan et al. 2005), the government of Ontario decided in 2001 to establish a new medical school with a social accountability mandate to contribute to improving the health of the people and communities of Northern Ontario. The Northern Ontario School of Medicine (NOSM) is a joint initiative of Laurentian University in Sudbury (population 160,000) and Lakehead University in Thunder Bay (population 110,000). The two university campuses are over 1000 km (700 miles) apart by road and provide teaching, research and administrative bases for NOSM, which is a rural-distributed, community-engaged school (Tesson et al. 2009).

### Practice points

Early outcomes suggest that NOSM is fulfilling its social accountability mandate including the following:

- 91% of all medical students are from Northern Ontario, including 7% Aboriginal and 22% Francophone students.
- 61% of all MD graduates have chosen family practice (predominantly rural) training.
- 65% of the graduates of NOSM's Family Medicine program, 29% of PA graduates and 80% of the NODIP graduates are practicing in Northern Ontario.
- The socioeconomic impact is spread throughout the service area and includes new economic activity, essentially double the School's budget, enhanced retention and recruitment for universities and hospitals/health services and development of community capacity and opportunities for innovation and growth.

In 1995, the World Health Organization (WHO) defined social accountability of medical schools as "the obligation to direct their education, research and service activities towards addressing the priority health concerns of the community,

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region and the nation that they have a mandate to serve" (Boelen 1995). More recently, social accountability has been identified as a change agent for the future with the potential to deliver high-quality education and graduates who respond to societal needs (Gibbs 2011). When NOSM was incorporated in 2002, it became the first medical school in Canada established with a social accountability mandate, which is to be responsive to the needs of the people and communities of Northern Ontario.

NOSM was established during the first decade of the twenty-first century, in parallel with a series of major reviews and reports, which present recommendations for the future direction of health professions education (UK General Medical Council 2009; Cooke et al. 2010; Frenk et al. 2010; The Association of Faculties of Medicine of Canada 2010). The report titled "Health professionals for a new century: transforming education to strengthen health systems in an interdependent world" written by the Lancet Global Independent Commission is a specific exemplar (Frenk et al. 2010). A common theme in all of these reports is the focus on graduating health professionals who have the skills and desire to provide health care that meets community needs – a focus for which NOSM was designed.

Uniquely developed through a community consultative process, the holistic cohesive curriculum for the NOSM's MD program is grounded in the Northern Ontario health context, organized around five themes (Strasser et al. 2009) and relies heavily on electronic communications and community partnerships to support Distributed Community Engaged Learning. In the classroom and in clinical settings, students explore cases from the perspective of physicians practicing in Northern Ontario. There is a strong emphasis on the interprofessional education and integrated clinical learning (ICL) that takes place in over 70 communities and many different health service settings, so that the students have personal experience of the diversity of the region's communities and cultures (Strasser et al. 2009; Strasser 2010; Strasser & Neusy 2010) (Figure 1).

ICL involves team teaching and team learning in a variety of clinical and community settings. Patients and families are the central focus of this learning in which teachers may be medical, nursing or other health professionals or the patients/families themselves, and learners may be in a mix of health disciplines and at different levels of undergraduate and postgraduate education. ICL enriches the learning experience for all and enhances capacity in small communities while maintaining high-quality patient care and preparing learners to be competent health care team members.

NOSM was the first medical school in the world in which all students undertake a longitudinal integrated clerkship, the Comprehensive Community Clerkship (CCC) (Couper et al. 2011; Strasser & Hirsh 2011). Based in family practice, the CCC is in the third year of the MD program. Rather than a series of clerkship block rotations, students meet patients in family practice such that "the curriculum walks through the door". Students follow these patients and their families, including when cared by other specialists, so as to experience continuity of care in family practice. During the year, students achieve learning objectives that cover the same six-core clinical disciplines as in the traditional clerkship blocks. Students live in one of the 13 large rural or small urban communities in Northern Ontario, excluding the cities of Sudbury and Thunder Bay. This allows them to learn their core clinical medicine from the family practice, community perspective, while also gaining exposure to community-based specialist care.

In the early 1990s, family medicine residency programs were established in northwestern Ontario through the Northwestern Ontario Medical Program under the auspices of McMaster University and in northeastern Ontario by the Northeastern Ontario Medical Education Corporation in association with the University of Ottawa. Both these family medicine residency programs provided community-based medical education using the preceptor model of one-on-one teaching and learning in the clinical setting. In addition, these programs focused on preparing family medicine residents to practice in Northern Ontario and in similar northern, rural and remote areas. Both the programs were very successful as measured by the fact that after 15 years over 60% of their graduates were practicing in Northern Ontario (Heng et al. 2001). Following College of Family Physicians of Canada new program approval, the NOSM family medicine residency program began in 2007 so that the first NOSM family medicine residents completed residency in 2009 alongside the first MD graduates. In addition, NOSM now offers residency training in eight major general specialties accredited by the Royal College of Physicians and Surgeons of Canada (NOSM Postgraduate Medical Education Overview 2012).

In addition to the MD program and residency programs, NOSM established the Northern Ontario Dietetic Internship Program (NODIP) in 2007 (Northern Ontario Dietetic Internship Program Overview 2012) and collaborated with the University of Toronto and the Michener Institute of Applied Health Sciences to initiate the Physician Assistant Education Consortium in 2010 (Physician Assistant Education Consortium 2012). Like the MD program, these programs recruit students from Northern Ontario or similar backgrounds and provide clinical education in a range of community and clinical settings in the region.

This article presents initial outcomes for graduates of NOSM's MD, Dietetic Internship and Physician Assistant programs, as well as the socioeconomic impact that NOSM has had on the region, highlighting a particular consistency with the recommendations of the Lancet Global Independent Commission report (Frenk et al. 2010).

## Methods

The Centre for Rural and Northern Health Research (CRaNHR) is a research center of both Laurentian and Lakehead Universities and was established in 1992 (About CRaNHR 2012). NOSM and CRaNHR are collaborating in mixed methods studies that track NOSM undergraduate and postgraduate medical learners and dietetic interns, as well as assessing the socioeconomic impact of NOSM. These studies use administrative data from NOSM and external sources, as well as surveys and interviews of students, graduates and other informants. Ethics approval for these studies was granted by



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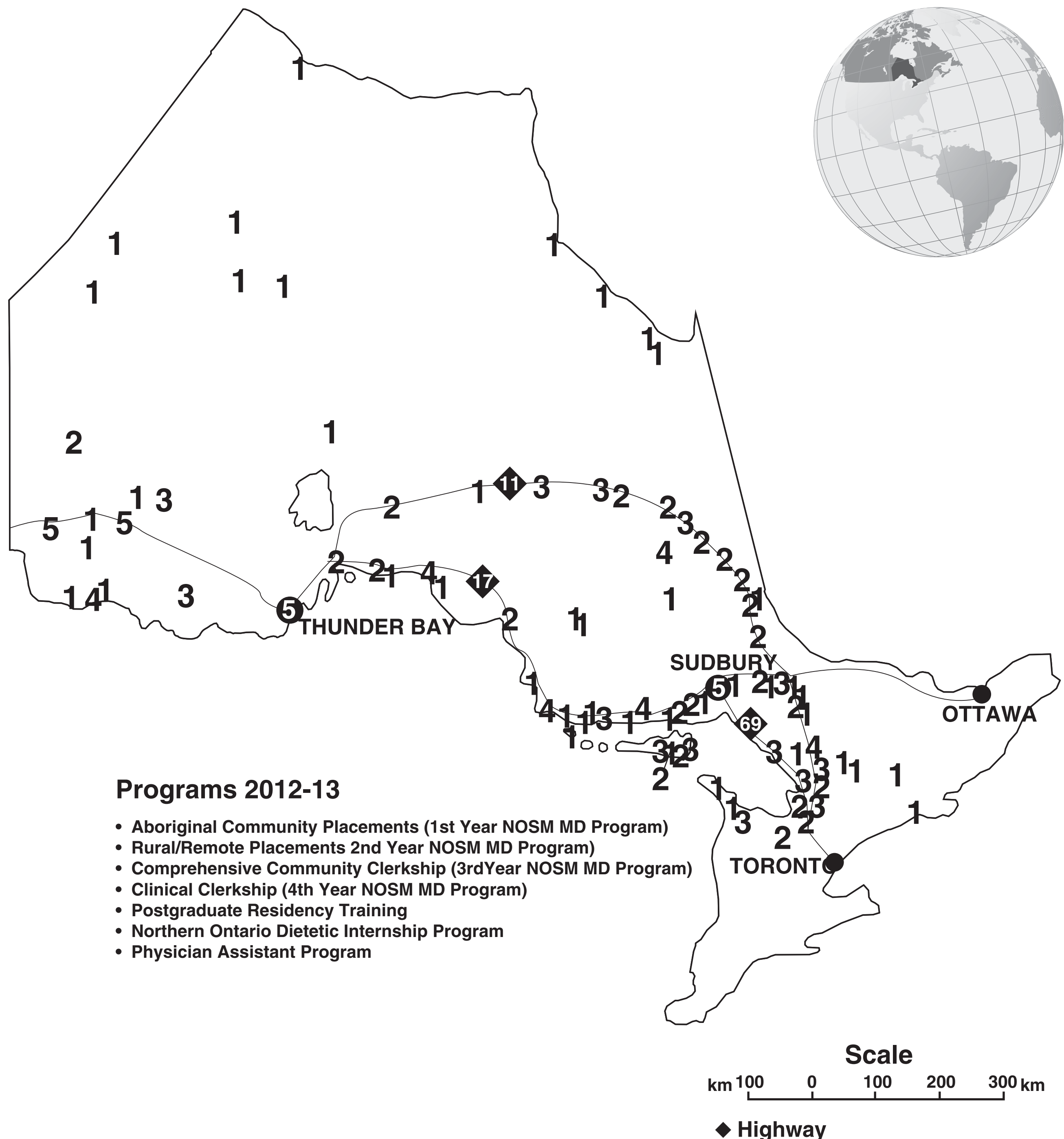


**Figure 1.** Map showing the number of NOSM educational programs in each community distributed across the Province of Ontario, Canada. Lines are major highways and there only a few roads north of highways 11 and 17 in Northern Ontario. For more details, refer to www.nosm.ca.

the Research Ethics Boards of Laurentian and Lakehead Universities.

## Results

Consistent with its social accountability mandate, NOSM seeks to reflect the population distribution of Northern Ontario in each class. Between 2005 and 2010, NOSM received 12,000 applications for 346 places. The selection and admission processes resulted in 91% of all medical students coming from Northern Ontario with the remaining 9% from other rural and remote parts of Canada, with a substantial inclusion of Aboriginal (7%) and Francophone (22%) individuals. This has been achieved without sacrificing academic excellence; the mean grade point average each year has been 3.7 (out of 4), comparable with that of other Canadian medical schools.

Between 2009 and 2012, there were 220 MD graduates of whom 135 (61%) chose family medicine (predominantly rural) training, which is almost double the Canadian average. Almost all the other MD graduates (33%) are training in general



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| Community | Total | Aboriginal | Rural/Remote | CCC | Clerkship | Postgrad | NODIP | PA |
|---|---|---|---|---|---|---|---|---|
| Alliston | 2 | | 1 | | | 1 | | |
| Astorville | 1 | | | | | 1 | | |
| Almaquin Highlands | 1 | | 1 | | | | | |
| Atikameksheng Anishnawbek (Whitefish Lake) | 1 | 1 | | | | | | |
| Atikokan | 3 | | 1 | | | 1 | 1 | |
| Attawapiskat First Nation | 1 | 1 | | | | | | |
| Barrie | 2 | | | | | | 1 | 1 |
| Batchewana First Nation | 1 | 1 | | | | | | |
| Blind River | 3 | | 1 | | | 1 | 1 | |
| Bracebridge | 3 | | | 1 | | 1 | 1 | |
| Brighton | 1 | | 1 | | | | | |
| Brunswick | 1 | 1 | | | | | | |
| Burk'sFalls | 1 | | 1 | | | | | |
| Callandar | 1 | | | | | 1 | | |
| Chapleau | 1 | | 1 | | | | | |
| Cochrane | 2 | | 1 | | | 1 | | |
| Constance Lake First Nation | 1 | 1 | | | | | | |
| Couchichig First Nation | 1 | 1 | | | | | | |
| Deer Lake | 1 | 1 | | | | | | |
| Dryden | 5 | | 1 | 1 | | 1 | 1 | 1 |
| Eabametoong First Nation (Fort Hope) | 1 | 1 | | | | | | |
| Eagle Lake First Nation | 1 | 1 | | | | | | |
| Elliot Lake | 4 | | 1 | | | 1 | 1 | 1 |
| Emo | 1 | | 1 | | | | | |
| Englehart | 2 | | 1 | | | 1 | | |
| Espanola | 2 | | 1 | | | 1 | | |
| Fort Albany First Nation | 1 | 1 | | | | | | |
| Fort Frances | 4 | 1 | | 1 | | 1 | 1 | |
| Fort Severn First Nation | 1 | 1 | | | | | | |
| Fort William First Nation | 1 | 1 | | | | | | |
| Garden River First Nation | 1 | 1 | | | | | | |
| Geraldton | 2 | | 1 | | | 1 | | |
| Gore Bay | 3 | | 1 | | | 1 | 1 | |
| Gravenhurst | 2 | | | | | 1 | 1 | |
| Haliburton | 1 | | 1 | | | | | |
| Hearst | 3 | | 1 | 1 | | 1 | | |
| Huntsville | 4 | | | 1 | | 1 | 1 | 1 |
| Iroquois Falls | 3 | | 1 | | | 1 | 1 | |
| Kapuskasing | 3 | | | 1 | | 1 | 1 | |
| Kenora | 5 | 1 | | 1 | | 1 | 1 | 1 |
| Kingfisher | 1 | 1 | | | | | | |
| Kirkland Lake | 2 | | 1 | | | | | 1 |
| Kitchenuhmaykoosib Inninuwug (Big Trout Lake) | 1 | 1 | | | | | | |
| Lac La Croix First Nation | 1 | 1 | | | | | | |
| Lac Seul First Nation | 1 | 1 | | | | | | |
| Lion's Head | 1 | | 1 | | | | | |
| Little Current | 3 | | 1 | | | 1 | 1 | |
| M'Chigeeng First Nation | 1 | 1 | | | | | | |

| Community | Total | Aboriginal | Rural/Remote | CCC | Clerkship | Postgrad | NODIP | PA |
|---|---|---|---|---|---|---|---|---|
| Manitowaning | 2 | | 1 | | | | 1 | |
| Marathon | 4 | | 1 | | | 1 | 1 | 1 |
| Matheson | 2 | | 1 | | | | 1 | |
| Mattagami First Nation | 1 | 1 | | | | | | |
| Midland | 3 | | 1 | | | | 1 | 1 |
| Mindemoya | 2 | | 1 | | | 1 | | |
| Mississauga First Nation | 1 | 1 | | | | | | |
| Mnaamodzawin Health Services | 1 | 1 | | | | | | |
| Moose Cree First Nation | 1 | 1 | | | | | | |
| Moose Factory | 1 | | | | | 1 | | |
| Muskrat Dam First Nation | 1 | 1 | | | | | | |
| Nairn | 2 | | 1 | | | 1 | | |
| Naokamegwanning First Nation (Whitefish Bay) | 1 | 1 | | | | | | |
| New Liskeard | 1 | | | | | 1 | | |
| Nibinamik First Nation (Summer Beaver) | 1 | 1 | | | | | | |
| Nipigon | 2 | | 1 | | | 1 | | |
| Nipissing First Nation | 1 | 1 | | | | | | |
| North Bay | 3 | | | 1 | | 1 | 1 | |
| Northwest Bay First Nation | 1 | 1 | | | | | | |
| Orilla | 3 | | 1 | | | | 1 | 1 |
| Owen Sound | 3 | | 1 | | | | 1 | 1 |
| Parry Sound | 3 | | | 1 | | 1 | | 1 |
| Penetanguishene | 2 | | 1 | | | | 1 | |
| Pic River First Nation | 1 | 1 | | | | | | |
| Powassan | 2 | | 1 | | | 1 | | |
| Red Lake | 2 | | 1 | | | 1 | | |
| Richard's Landing | 1 | | | | | 1 | | |
| Sagamok Anishnawbek | 1 | 1 | | | | | | |
| Sandy Lake First Nation | 1 | 1 | | | | | | |
| Sault Ste. Marie | 4 | | 1 | 1 | | 1 | 1 | |
| Schreiber | 2 | | 1 | | | 1 | | |
| Serpent River First Nation | 1 | 1 | | | | | | |
| Sioux Lookout | 3 | | | 1 | | 1 | 1 | |
| Smooth Rock Falls | 2 | | 1 | | | 1 | | |
| Sturgeon Falls | 2 | | | | | 1 | 1 | |
| Sudbury | 5 | 1 | 1 | | 1 | 1 | 1 | 1 |
| Temagami First Nation | 2 | 1 | | | | 1 | | |
| Temiskaming Shores | 2 | | | 1 | | | 1 | |
| Terrace Bay | 1 | | | | | 1 | | |
| Thessalon | 1 | | | | | | 1 | |
| Thunder Bay | 5 | 1 | 1 | | 1 | 1 | 1 | 1 |
| Timmins | 4 | 1 | | 1 | | 1 | 1 | |
| Vermillion Bay | 1 | | | | | 1 | | |
| Verner | 1 | | | | | 1 | | |
| Wawa | 2 | | 1 | | | 1 | | |
| Waypoint | 1 | | 1 | | | | | |
| Wiarton | 1 | | 1 | | | | | |

**Figure 1.** Continued.



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specialties such as general internal medicine, general surgery and pediatrics, with a small number (6%) training in subspecialties like dermatology, plastic surgery and radiation oncology. Thirty-five percent of NOSM graduates are continuing their training in Northern Ontario and many of the others have indicated their intention to practice in Northern Ontario in the future. A growing number of NOSM MD graduates are now practicing family physicians in Northern Ontario and some of them have become NOSM faculty members.

In the Medical Council of Canada (MCC) Part I examination, NOSM students have performed consistently above the national average, with very high scores in the section on clinical decision making. NOSM offers residency training in family medicine through the Family Medicine Residents of the Canadian Shield (FM RoCS) program plus enhanced skills in third year postgraduate positions, and residency programs in eight other major general specialties. In 2008 and 2010, NOSM residents' total scores in the MCC Part II (clinical) examination placed NOSM number 1 of 17 medical schools. Sixty-five percent of NOSM residents stay in Northern Ontario after completing their training.

NODIP is a one-year distributed, community-based program which provides dietetic practice experiences in urban, rural, remote and under-serviced areas of Northern Ontario. Admission to NODIP includes an emphasis on candidates who have a desire to live, work and provide service in northern and rural communities. The academic and practical curriculum is designed to graduate dietitians with the skills to practice in a diverse range of settings including clinical practice, public health, administration, primary health care, long-term care and rural health care with additional cultural competence skills related to Francophone and Aboriginal health.

Between 2007 and 2011, 64 of the 253 applications to NODIP were accepted, 70% from Northern Ontario and 25% from locations elsewhere in rural Canada. Approximately 85% of the 66 who have graduated since 2008 are practicing in the region or other rural communities. A tracking study of the first cohort reveals that interns perceive that they were well trained for the breadth of clinical and community services required in rural settings. They saw themselves as prepared to counsel or coach clients, deliver effective client-centered and interprofessional care, plan clinical and community nutrition initiatives and communicate effectively using evidence-informed practices. All were confident about their ability to provide leadership and function in demanding work environments.

The Physician Assistant Education Consortium provides a two-year program for students with a previous degree and health experience. The first year is mostly classroom learning by distance education complemented by a series of intensive residential sessions in Toronto. In the second year, students undertake a series of clinical rotations half of which occur in Northern Ontario. All 14 graduates in the initial cohort completed the National Certification Exam with above average scores and have secured employment, including four (29%) in Northern Ontario.

A study of the socioeconomic impact undertaken in 2009 found that NOSM makes a substantial contribution to the economy of Northern Ontario, with direct spending in the fiscal year 2007–2008 (FY07/08) of $36 million (all values in Canadian dollars) and an additional $1 million per year spent by undergraduate medical students. In total, NOSM's activities were estimated to contribute $67–$82 million per year to the economy of Northern Ontario through direct, indirect and induced economic effects. The bulk of the economic contribution occurs in Sudbury and Thunder Bay, but other communities in Northern Ontario experience an estimated contribution of up to $1.4 million per year, depending on the extent of their involvement in NOSM activities. In FY07/08, NOSM funded 233 full-time equivalent positions located mostly in Sudbury and Thunder Bay. It is estimated that NOSM supports a total of 420–510 FTE positions in Northern Ontario through various economic effects. NOSM also pays stipends or honoraria to committee members, Aboriginal elders and to more than 670 clinical preceptors in over 70 communities. These are likely conservative estimates because at the time of study, the following components were not yet in place: undergraduate year 4; postgraduate years 2–5 and capital or operating funds paid directly to hospitals in support of their teaching duties.

In terms of social impact, interviewees reported that NOSM is a source of civic pride and an affirmation of the north's potential as the region enlarges its knowledge-based economy. According to interviewees, NOSM has enriched the reputation of the host universities and affiliated health care institutions, thereby enhancing the ability to recruit new physicians, researchers and scientists to the north. Interviewees anticipated that NOSM graduates will ultimately relieve the chronic physician shortage in Northern Ontario. Interviewees also remarked that Francophone and Aboriginal students enrolled at NOSM and the School's commitment to cultural competency training should help alleviate the shortage of physicians serving these population groups.

The most impressive social impact finding was a sense of community empowerment summed up in the phrase "if we can do a successful medical school in Northern Ontario, we can do anything". The establishment of NOSM and its distributed programs offered opportunities for change and challenges to the status quo. Following the success of NOSM, Laurentian University has gained approval to establish an Architecture School in 2013 and Lakehead University will open a Law School in the same year.

## Discussion

This article has presented early outcomes for graduates of NOSM's health professional education (HPE) programs, as well as the socioeconomic impact of NOSM. Clearly, there are limitations in this research, particularly small numbers and the relatively short time frame. Tracking studies of NOSM graduates will continue and opportunities will be sought to investigate further the School's economic and social impacts.

Although it is too early to draw firm conclusions, the findings reported in this article suggest that NOSM is an example of successful implementation of many recommended reforms in HPE.



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NOSM's approach to HPE is derived from and guided by its social accountability mandate. This approach is consistent with the recommendations of the Future of Medical Education in Canada MD vision; the Carnegie Foundation calls for reform and the Lancet Global Independent Commission's transformative and interdependent professional education for equity in health (Cooke et al. 2010; Frenk et al. 2010; The Association of Faculties of Medicine of Canada 2010). In addition, NOSM is implementing all of the education and training components of the WHO global policy recommendations: increasing access to health workers in remote and rural areas through improved retention (WHO 2010).

The NOSM selection and admission processes have been effective in recruiting learners who come mostly from Northern Ontario or similar northern, rural, remote, Aboriginal and/or Francophone backgrounds. This recruitment success has occurred without lowering academic standards and has helped to ensure that NOSM learners are well suited to the challenges and opportunities of Distributed Community Engaged Learning.

Distributed Community Engaged Learning involves learners undertaking clinical education in over 70 locations supported by electronic communications and interdependent partnerships with local communities, health services and health professionals. Through Community Engagement, the community members are active participants in various aspects of the School including the admissions process, as standardized patients, ensuring that learners feel "at home" in their community and in encouraging an understanding and knowledge of the social determinants of health at the local level.

A key feature of the NOSM education programs is learning in context. In the classroom and in community/clinical settings, the health professional learners are learning as if they will be practicing in Northern Ontario. This includes a strong emphasis on cultural competence, as well as social and population health. Particularly with prolonged clinical attachments, learners become members of the health team and active contributors to health care. This enhances their clinical confidence and competence, and ensures that their clinical knowledge and skills are embedded in the local rural community setting (Hauer et al. 2012).

Graduates of NOSM programs have achieved above-average scores in the national examinations including top ranking scores in the clinical decision-making and patient interaction sections of the MCC examinations. In 2008 and 2010, NOSM residents' total scores in the MCC Part II (clinical) examination placed NOSM number 1 of 17 medical schools. These results clearly contradict the common perception of lower academic standards in rural or community-based schools.

There is a striking consistency between NOSM approach and the reforms recommended by the Lancet Global Independent Commission (Frenk et al. 2010). Specifically, NOSM's rapid development is a result of collaborations and networking which have encouraged development of academic systems guided by a dedication to enquiry, one of NOSM's key academic principles (NOSM Academic Principles 2012). In terms of curriculum, NOSM's programs are competency-based including cultural competency, promote interprofessionalism and integration, exploit the power of IT for learning, draw on global experience to enhance local learning, encourage socially accountable professionalism and strengthen education resources through interdependent partnerships with local communities, health services and health professionals.

In addition, NOSM is a founding member of the Training for Health Equity network (THEnet) group of medical schools, which have a social accountability mandate (Palsdottir et al. 2008). Since 2008, THEnet has developed, piloted and published "Evaluation Framework for Socially Accountable Health Professional Education" (The Training for Health Equity Network 2011; Larkins et al. 2013), which provided the core content for the Global Consensus for Social Accountability (GCSA) of Medical Schools (Global Consensus for Social Accountability of Medical Schools 2012). Following the GCSA, AMEE has adopted social accountability as one of the elements of the ASPIRE: International Recognition of Excellence in Medical Education program (www.amee.org).

## Conclusion

After seven years of recruiting applicants from an underserved health workforce region, there are signs that NOSM is successful in graduating health professionals who have the skills and desire to provide health care in rural and remote communities and that NOSM is having a positive socioeconomic impact on Northern Ontario. All told, there is evidence that NOSM's rural-distributed community-engaged HPE programs are having a pervasive, extensive and constructive influence on this rural underserved region.

***Declaration of interest***: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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