

LETTER TO THE EDITOR**To THE EDITOR****RE: Canadian Assessment of Deep Brain Stimulation Access: The Canada Study**

We conducted a secondary analysis on the data presented in Honey et al.¹ and have uncovered a possible access problem to deep brain stimulation (DBS) in rural areas of the Atlantic provinces (Prince Edward Island, New Brunswick, Newfoundland & Labrador).

As a resource-intensive procedure, DBS surgery is centralized to Canada's major medical centers. Given the rich dataset presented by Honey and colleagues, we were interested to further explore how centralization may specifically impact populations living in rural areas as well as in provinces that lack local DBS services.

Using the data from Table 1 of the target article, we calculated the number of DBS cases per million people per year for the urban and rural areas of each Canadian province and nationally (Figure 1).¹ The results show that most provinces had only minimal differences between their urban and rural DBS rates, with the exceptions of Saskatchewan, Prince Edward Island, and New Brunswick. The DBS rate in rural areas of Saskatchewan was much higher than in urban areas, and the opposite trend was seen in the other two provinces.

Honey and colleagues account for a number of probable reasons for the inflated DBS rates in Saskatchewan, and we suggest that the higher rural rates may have been attributable to the use of remote communication technologies for follow-up care during the study period.¹

Understanding the disparities between urban and rural areas of Prince Edward Island and New Brunswick is more challenging due to the small number of cases in these provinces. To further analyze these trends, we applied our calculation of Canada's national rate (10.2 cases per million people per year) to each of the three Atlantic provinces, their respective rural areas, and to an aggregate of the three and compared these estimates to the actual number of surgeries performed (Table 1).

We found that if the per capita DBS case rate in Canada is shared uniformly across the Atlantic provinces, there should have been approximately 12 additional DBS cases from the combined rural areas of New Brunswick, Prince Edward Island, and

Newfoundland & Labrador in the study period. For rural New Brunswick, there should have been about seven additional cases. The calculations also provide further insight into the significant DBS access issue in Newfoundland & Labrador, showing that both urban and rural areas experienced access disparities. The numbers from Prince Edward Island are too small to generate any trend.

While we did not have access to the age standardization data used in the target article to ascertain statistical significance, this secondary analysis suggests that there may be an issue with DBS service to rural areas of the Atlantic provinces when compared to Canada as a whole.

The Territories may be at risk for similar disparities, as they also lack local DBS services. While the study window was too small to capture enough DBS cases to provide a picture of access for these areas, there are ethical complexities to be considered for the north, including vast geographies with low population densities and many remote communities, and large Indigenous populations. Limited knowledge exists about the meaningfulness of DBS for geographically and culturally diverse communities, such as how features of the technology – invasiveness, risk, requirement for frequent follow-up care and programming, and living with a brain implant among others – are conceptualized.

It is imperative that as technologies used in functional neurosurgery become increasingly specialized, and new technologies such as magnetic resonance imaging-guided focused ultrasound (MRgFUS) come on the neurosurgical scene in Canada, the ethical complexities of access are explored in the earliest stages of development and ahead of rollout. Our findings here combined with those of Honey and colleagues suggest that an effective plan is needed to ensure that all Canadians have meaningful access to these advancements before they are ready for implementation, not just populations who live close to major medical centers or belong to certain socioeconomic groups. Looking to the example of Saskatchewan as described by Honey and colleagues, essential changes may include implementing remote presence robotic technologies in follow-up care, training and hiring more functional neurosurgeons, removing funding caps, and dedicating operating room time to these procedures.¹ Without an effective plan, significant disparities will only increase and continue to challenge the central promise of the Canada Health Act “to protect, promote and restore the physical and mental well-being

Table 1: Deep brain stimulation (DBS) cases in Atlantic Provinces compared with expected numbers if Canadian per capita rate is applied

Province	Expected number of DBS cases over two years if Canadian per capita rate is applied	Actual number of DBS cases over two years	Expected number of DBS cases in rural areas over two years if Canadian per capita rate is applied	Actual number of DBS cases in rural areas over two years
NB	15	13	7	0
NL	11	4	4	1
PE	3	2	2	0
NB+NL+PE	29	19	13	1

DBS = Deep Brain Stimulation; NB = New Brunswick; NL = Newfoundland & Labrador; PE = Prince Edward Island.

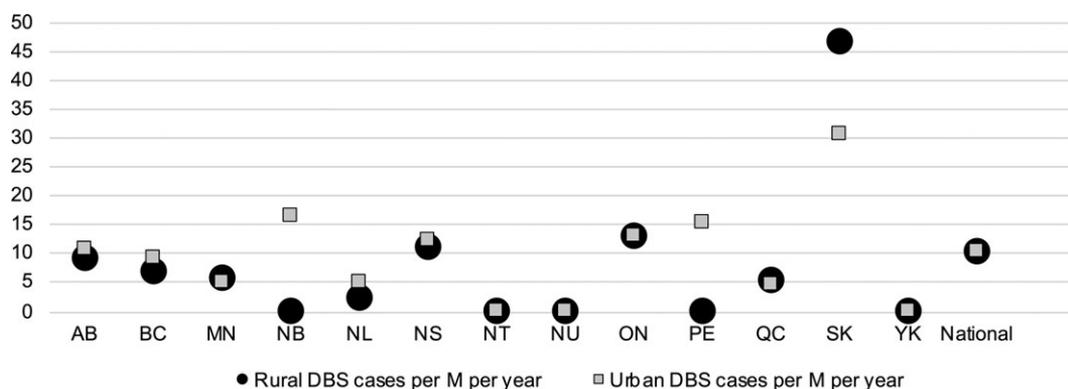


Figure 1: Urban and rural deep brain stimulation (DBS) rates across Canada. AB: Alberta; BC: British Columbia; MB: Manitoba; NB: New Brunswick; NL: Newfoundland & Labrador; NS: Nova Scotia; NT: Northwest Territories; NU: Nunavut; ON: Ontario; PE: Prince Edward Island; QC: Quebec; SK: Saskatchewan; YK: Yukon.

of residents of Canada and to facilitate reasonable access to health services without financial or other barriers".²

This work was supported in part by the National Institutes of Health (NIH) BRAIN Initiative on Neuroethics [RF1 # MH117805 01] and the North Growth Foundation. JI is Canada Research Chair in Neuroethics.

DISCLOSURES

The authors have no conflicts of interest to declare.

STATEMENT OF AUTHORSHIP

LH: Conceptualization and design of the study. LH and JI: Data analysis and interpretation; drafting of the manuscript

Louise Harding
Neuroethics Canada, Division of Neurology, Department of
Medicine, University of British Columbia, Vancouver,
British Columbia, Canada

Judy Illes

Neuroethics Canada, Division of Neurology, Department of
Medicine, University of British Columbia, Vancouver,
British Columbia, Canada

Correspondence to: Dr. Judy Illes, CM, Neuroethics Canada, University of British Columbia, 2211 Wesbrook Mall, Koerner S124, Vancouver, BC V6T 2B5, Canada. Email: jilles@mail.ubc.ca

REFERENCES

- Honey CM, Malhotra AK, Tamber MS, Prud'homme M, Mendez I, Honey CR. Canadian assessment of deep brain stimulation access: the Canada study. *Can J Neuro Sci.* 2018;45: 553–58.
- Canada Health Act*, 1984, c. 6, s. 3. Retrieved from <https://laws-lois.justice.gc.ca/eng/acts/c-6/page-1.html#h-151484>