The University of Alberta is situated on Treaty 6 territory, traditional lands of First Nations and Métis people.

Early-stage Impacts of LEO Satellite Systems in Remote Indigenous Communities:

Canada's Northwest Territories

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Satellites and Beyond: Ivey Workshop

Context of Telecommunications in Northern Canada

Context for rural/remote (Indigenous) communities:

- History of slow speeds, unreliable service, high prices and data caps, limited competition
- New competition via LEO systems alongside (subsidized) investments from incumbent Northwestel
- *CRTC 2022-147* – Review of Northern telecom services; potential consumer/provider subsidies
- ***Forthcoming decisions:*** Indigenous Broadband Fund; Indigenous spectrum set-asides / priority window

Nunatsiaq; Denendeh; Northwest Territories

- 1.3M square kilometres
- 44,000 people, majority in regional hubs
- 29 of 33 communities have a few hundred residents
- Accessible by flights and/or seasonal ice roads
- Limited local ‘brick and mortar’ services

Dempster Highway from Yukon to NWT
Photo by Hanne Pearce (2019).
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LEO (Starlink) Considerations for Rural/Remote Communities

- **Speed/QoS:** Starlink currently has limited customer base; speed/service may decline
  - News reports that Starlink is “at capacity” in the Yukon
- **Affordability:** Consumer costs relatively high (~$500 equipment + $140 / month).
  - Reports that Starlink ended $100 discount in U.S. states with “abundant network availability”
- **Reliability:** Reliability unclear at this time.
  - Terminals are easy to install but no local technicians available if something goes wrong.
- **Local Control:** Highly centralized system controlled by SpaceX.
  - Direct-to-home business model limits opportunity for community-owned networks.
  - Equipment and monthly costs for backhaul model that allows local access networks are very high.

Our research considers these user experiences during early-stage deployment of Starlink.

Project: Indigenous Family Connections NWT (2023-2026)

Native Women's Association (NWT) - participating families receive subsidized access to satellite Internet services.

Computer for Schools / Smart Communities Society (NWT) - participating families receive refurbished computers.

UAlberta - evaluating Internet connectivity and researching impacts with communities. Focus on end-user experiences based on primary data.

Project funded by **Indigenous Services Canada (Government of Canada)**

Aklavik, NT - 536 people; 220 dwellings (2021 Census)

Lutselk’e, NT - 333 people; 130 dwellings (2021 Census)

Mixed Methods Surveys – Comparative Analysis

Baseline research conducted prior to introduction of any subsidized service

Quantitative: HH surveys with 45 questions on digital inclusion, connection quality, attitudes

- ***Descriptive statistics*** (frequencies, percentages, means) to summarize survey results.

Qualitative: Open-ended responses about community experiences, challenges, and feedback

- ***Content analysis*** to identify themes.

Community	**Starlink users**	**Other users**	**Total**	**Response Rate (% of total HH)**
Aklavik	15	24	39	18%
Lutselk'e	6	13	19	15%
Total	**21**	**37**	**58**	**17% (1 out of 6 HH)**

Insight 1: Larger households may prefer Starlink to avoid data overage fees

Aspect	Group 1: Starlink	Group 2: Other	Significant difference?
Household size	**4.05** people per household (SD = 1.60)	**3.08** people per household (SD = 1.19)	YES: p = 0.011
Desktop computers	Avg. 0.90 (SD = 1.41)	Avg. 0.35 (SD = 0.94)	No
Laptop computers	Avg. 0.95 (SD = 0.86)	Avg. 0.84 (SD = 1.01)	No
Tablets	Avg. **1.48** (SD = 1.29)	Avg. **0.86** (SD = 1.44)	YES: p < 0.05
Mobile Phones	Avg. **3.62** (SD = 1.63)	Avg. **2.06** (SD = 1.80)	YES: p < 0.05

Open-ended Responses: Changes after Starlink Subscription (N=15)

	% of 15
Performance	
Faster speed	9 (60.0%)
Better reliability	4 (20.0%)
General positive feedback	3 (20.0%)
No difference	2 (13.3%)
Affordability	
Cheaper	9 (60.0%)
No difference	3 (20.0%)

Sample Responses:

"*Yes, children use it with class Raz-Kids accounts each night, and we are not turning it off to try to save GB [data].*"

"*Yes, stream TV all night—don't have to worry about limit on internet.*"

"*not having a limit on internet usage and having a consistent bill each month has helped with expenses*".

Insight 2: Starlink users report fewer Internet service challenges

Other users report significantly more issues with:

- Internet speed
- Signal quality
- High cost of internet
- Data caps

Variable	Group	N	Mean	Std. D	F	*p*
Bad condition of devices (e.g. computers or phones are too old or broken)	Other	37	3.11	1.61	0.03	0.22
	Starlink	21	2.57	1.54		
Difficulties purchasing/ordering devices*	Other	37	3.19	1.54	0.38	0.03
	Starlink	20	2.25	1.33		
Access to repair shop (phone, computer, etc.)	Other	37	2.86	1.83	0.11	0.91
	Starlink	21	2.81	1.72		
Reliability of online applications (e.g. Skype or Zoom; cloud storage like Drop Box; etc)*	Other	37	2.95	1.61	7.55	0.00
	Starlink	21	1.71	0.90		

Variable	Group	N	Mean	Std. D	F	*p*
Unavailability of Internet*	Other	37	3.03	1.66	4.92	0.03
	Starlink	21	2.10	1.09		
Slow speed of Internet*	Other	37	3.22	1.65	0.79	0.04
	Starlink	21	2.33	1.43		
Bad quality of Internet (signal drops, speed varies, etc)*	Other	37	3.32	1.53	2.27	0.02
	Starlink	21	2.38	1.12		
High cost of Internet*	Other	37	3.35	1.64	3.33	0.02
	Starlink	21	2.38	1.16		
Data caps*	Other	37	3.03	1.80	6.67	0.00
	Starlink	21	1.71	1.23		
High cost of devices (phones, laptops, tablets, etc)*	Other	37	3.57	1.48	0.23	0.08
	Starlink	21	2.86	1.42		
Availability of devices at home (need to share them, need to use at school or work)	Other	37	2.97	1.67	0.27	0.31
	Starlink	21	2.52	1.50		

Insight 3: Starlink users more likely to access online services

Context: Lack of local ‘brick and mortar’ services

Statistically significant difference in urban center visits (p = 0.024).

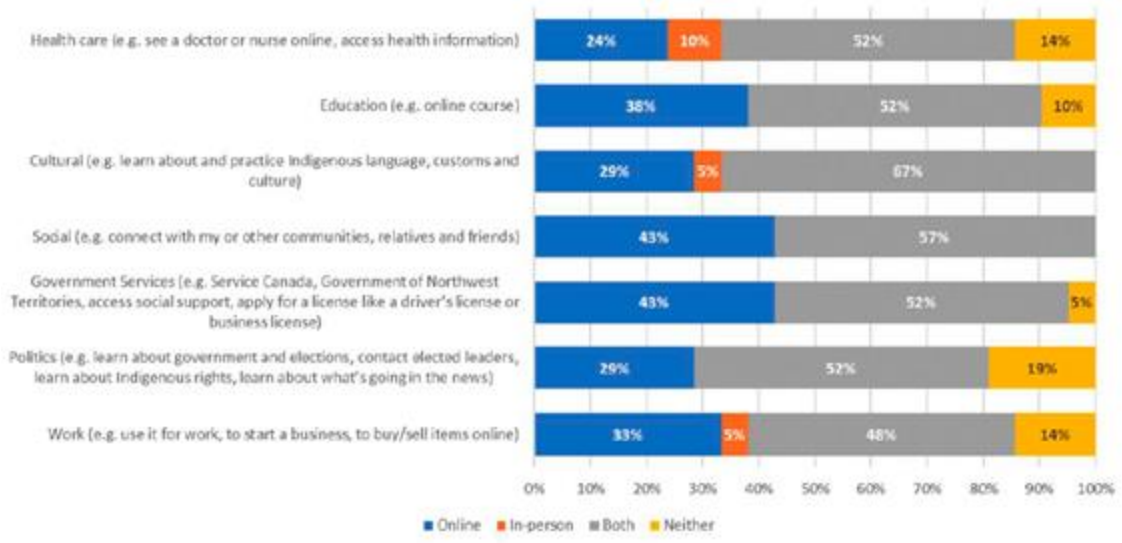
- “Other” users visit more frequently, potentially due to lack of online access to services.

Variable	Group	N	Mean	SD	t	*p*
Urban center visitation frequency	Starlink	21	2.57	1.16	2.314	.024
	Other	37	3.27	1.07		

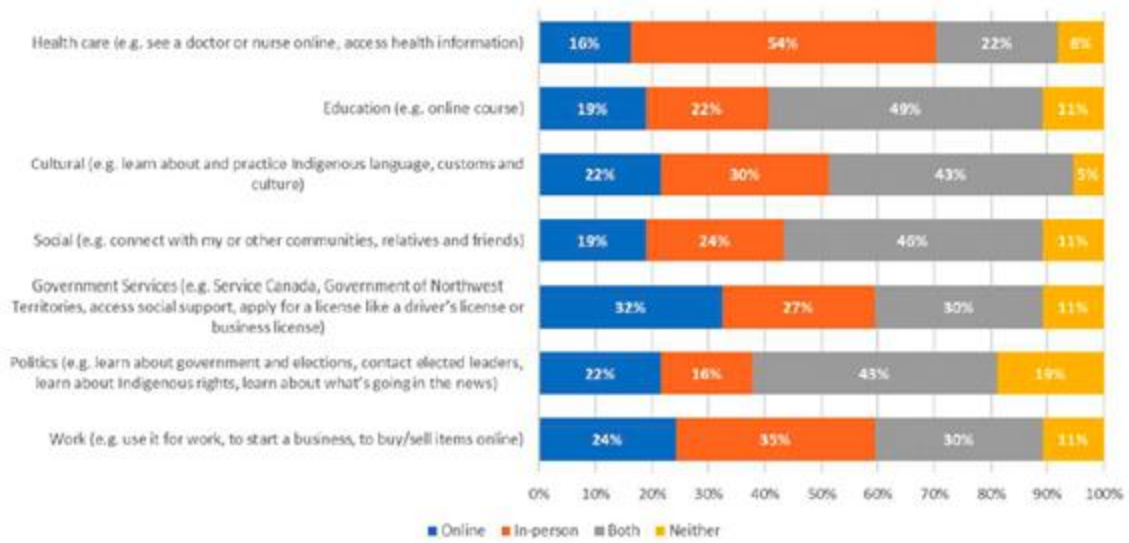
Frequency coded from 0 to 6, with "0" indicating "Never" and "6" indicating "Once per week."

Self-Reported Ways Respondents Access Services (% of responses)

Starlink users
(N=21)



Other users
(N=37)



Blue indicates “online” access
Orange indicates “in-person” access

Insight 4: Starlink may enable more engagement in digital economy

Starlink users more active in E-commerce, online service provision and remote work.

Economic activity	Starlink		Other	
	Responses	%	Responses	%
Banking services	17	81%	31	84%
Booking travel services for others (e.g., charter flights, hotels)	14	67%	22	59%
Buy/Sell goods online (e.g., food, clothing, crafts, electronics on Facebook Marketplace)	19	90%	24	65%
Buy/Sell services online (e.g., accounting/book-keeping, IT support, photography/web design, transportation, odd jobs on Facebook Marketplace)	17	81%	16	43%

Economic activity	Starlink		Other	
	Responses	%	Responses	%
Drone photography / delivery services	7	33%	6	16%
Social media influencer (e.g. Instagram or TikTok or YouTube account offering endorsements of products or services)	15	71%	20	54%
Subscriber-based content creator (e.g., online journalist, blogger, podcaster, etc.)	9	43%	6	16%
Work from home using the Internet / computer	18	86%	22	59%

Study Limitations and Future Research Directions

Data collected during ‘honeymoon’ period

- *Most participants signed up for Starlink ~1 year ago*

Generalizability / Low number of participants / Potential “early adopters”

- *However - communities are small-population*
- *No statistical significance between self-reported levels of digital literacy*

Reliance on survey data

- *Recently deployed 19 computers in Lutselk’e and 31 in Aklavik – Internet Performance Test software*
- *Planning follow-up interviews in Lutselk’e in Dec 2024*

Remote coordination with local surveyors required substantial effort

- *Underscores importance of in-person connection and collaboration*
- *Developing methods to improve validity/reliability (e.g. geolocation)*

Focus on ‘positive’ benefits

- *Increased access also results in anti-social content and problematic online behaviour*
- *Future research will research negative impacts as well as strategies to mitigate risks*