# Carbon Footprint of Patient Travel for Kidney Care in British Columbia

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## INTRODUCTION

Hemodialysis (HD) is an environmentally intensive kidney replacement therapy, with per patient yearly greenhouse gas emissions of 3960 kg CO2 in British Columbia (BC)[1]

Patient transportation to in-centre and satellite units in Australian and American programs, respectively, contributed to 5.8% and 28.3% of total dialysis sourced CO2 emissions[2,3]

## AIMS

1. To quantify province-level driving distances and associated CO2 emissions data for patient travel to dialysis therapies per treatment, and per year

2. To compare per treatment and per year travel distances and CO2 emissions for:
   a) in-centre (IC) vs. satellite HD
   b) home dialysis modalities vs. in-centre and satellite HD

3. To describe modality-specific mean travel distance and CO2 emissions by Health Authority (HA), per treatment and per year

## METHODS

- PROMIS (Patient Records and Outcome Management Information System) database was queried on February 28, 2023 to provide shortest road distance travelled between latitude and longitude of the geographic centres of each PROMIS-listed residential postal code and corresponding HD facility
  - Ethics approval was obtained by the UBC Behavioural Research Ethics board
  - This project also received approval from BC Renal
  - Patient postal code remained confidential
- Patients registered in PROMIS from Jan 1 – Dec 31 2022 included; Pediatric patients and non-BC resident patients excluded
- HandiDart status was specified in only 6.3% of records; private vehicle travel was otherwise assumed
- Vehicle standard emission conversion factors were obtained from Environment Canada database to determine emissions (reported in carbon dioxide equivalents (CO2e))

## RESULTS

- 17,326 PROMIS records queried to identify 1489 in-centre HD, 1047 satellite HD, 132 home HD, and 869 peritoneal dialysis (PD) patients

Emissions by Dialysis Modality

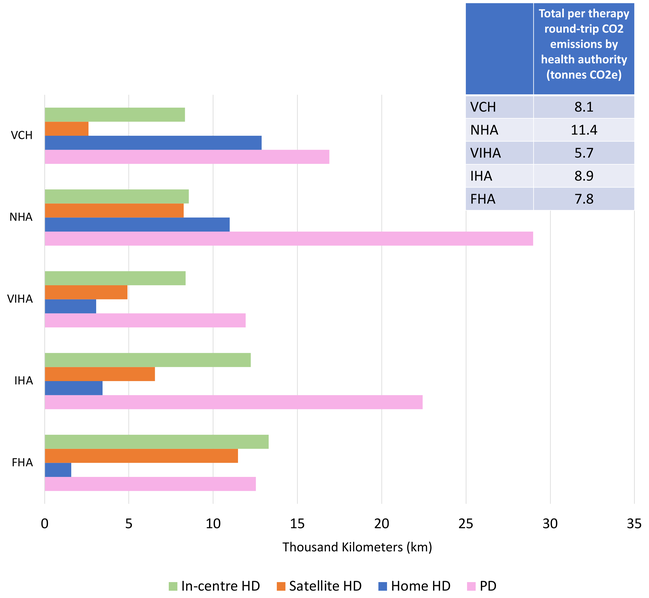
- Summative **per treatment** driving distance for all dialysis patients in BC is 208,114 km round-trip (or 41.6 tonnes of CO2e)
- Summative **per year** driving distance exceeds 13.5 million km, emitting 2703 tonnes CO2e
  - In-centre HD and satellite HD, respectively, account for 57% and 39% of dialysis travel-associated emissions
  - Home therapies, despite having high per treatment travel distances, contribute significantly less CO2 emissions on an annual basis

Emissions by Health Authority

- Distance travelled differs by HA, hence emissions vary considerably:
  - Highest – Northern: 56,800 km round-trip (11.4 tonnes CO2e)
  - Lowest – Vancouver Island: 28,271 km round-trip (5.7 tonnes of CO2e)

| | Per treatment round-trip travel distance (km) | Per treatment round trip travel CO2 emissions (tonnes CO2e) | Per year round-trip travel distance (km) | Per year round-trip travel CO2 emissions (tonnes CO2e) |
|---|---|---|---|---|
| IC HD | 49,643 | 9.9 | 7,744,243 | **1548.8** |
| Satellite HD | 33,786 | 6.8 | 5,270,238 | **1054.0** |
| Home HD | 31,942 | 6.4 | 127,767 | **25.5** |
| Peritoneal dialysis | 92,746 | 18.5 | 370,986 | **74.2** |
| **TOTAL** | **208,114** | **41** | **13,513,234** | **2703** |

**Table 1** – Round-trip travel distances (km) and associated CO2 emissions (tonnes CO2e) by renal replacement modality




| | Total per therapy round-trip CO2 emissions by health authority (tonnes CO2e) |
|---|---|
| VCH | 8.1 |
| NHA | 11.4 |
| VIHA | 5.7 |
| IHA | 8.9 |
| FHA | 7.8 |

**Figure 2** – per therapy round-trip travel distance (km) by health authority
VCH: Vancouver Coastal Health; NHA: Northern Health Authority; VIHA: Vancouver Island Health Authority; IHA: Interior Health Authority; FHA: Fraser Health Authority

## CONCLUSIONS

- The driving distances and associated CO2e emissions of patient travel to / from dialysis programs in BC are significant, totalling 41.6 and 2703 tonnes CO2e respectively per treatment and per annum
  - By comparison, the average annual carbon footprint per capita in Canada is 14.3 tonnes of CO2e[4], hence dialysis travel in BC equates to yearly emissions of 189 Canadians
- Almost 40% of in-centre HD associated CO2e emissions originate from patient travel
- Home therapies account for under 4% of dialysis travel-related CO2e emissions
- Considerable differences exist in travel distances to HD between HAs
  - This study does not account for time and financial costs incurred by patients for travel
- Prioritizing home therapies, when appropriate, can lower dialysis-related atmospheric carbon pollution
- These data will be used to appeal to transit authorities for low-emissions light transport vehicles

## REFERENCES

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