Measuring Trends in Disease Occurrence across Three Palliative Care Programs

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Disease status is central to planning services at end of life. Palliative care program (PCP) data can be used but disease and co-morbidity information may be limited.

Purpose

To investigate changing trends in disease occurrence and co-morbidities in PCP enrollees in Nova Scotia (NS), Canada using **c**auses of death on death certificates.

Setting

Palliative care is decentralized to 9 District Health Authorities (DHA). Each has a PCP. Three study DHA are: Capital Health (CH), Cape Breton (CB), Colchester East Hants (CEH). Together, they have 65% of NS population of 940,000. CEH is the most rural and CH the most urban. While the PCPs have more than ten years of enrollee data, typically, only a single diagnosis at enrolment is listed. Death certificates provide a more complete profile of co-morbid conditions.

Study Subjects

121,458 deaths in NS from 1995 to 2009. Among these, 19,835 were enrollees in the PCPs in the three study DHAs from 1996-2009 for CH and CB, and 2002-2009 for CEH.

Method

PCP enrollee data from three DHAs were linked to Vital Statistics death certificate data for this population-based descriptive analysis. Up to 13 causes of death were listed for each decedent. Seven diseases were categorized: cancer, cardiovascular disease, COPD, renal disease, pneumonia, diabetes, and dementia. All causes of death were examined using multivariate regression to investigate trends over time controlling for age, sex and PCP.

Results

More males than females were enrolled CH and CB PCP while CEH had more females. CEH had the oldest enrollees with a mean age of 74.8 years compared with 69.3 and 71.7.

Table 1: Age and Sex Distribution of PCP enrollees

	Capital Health	Cape Breton	Colchester East Hants	Total of three PCPs
Female	48.8%	49.8%	52.6%	**49.3%**
Age	**69.3**	**71.7**	**74.8**	**70.4**

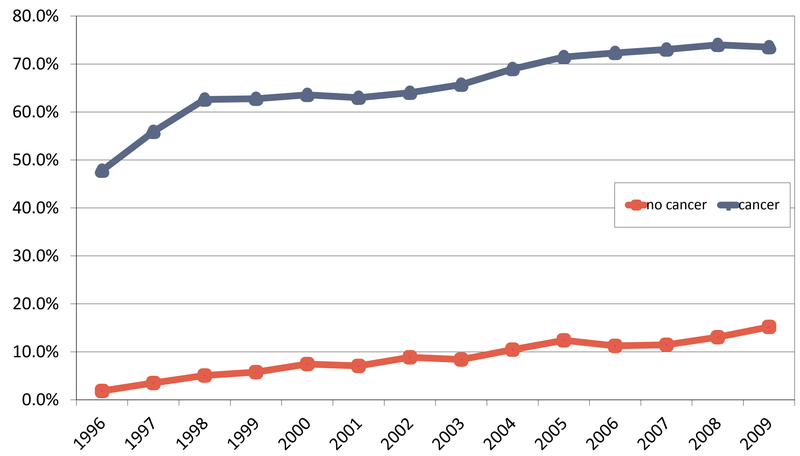
Among all NS decedents, 32.2% had a cancer cause of death, while 80.4% of PCP enrollees were cancer decedents. Non-cancer causes of death were observed more frequently for all NS decedents than for PCP enrollees. CEH had the lowest rate of cancer decedents (70.9%).

Table 2: Percent with Cause of Death using all causes

Cause of Death	All Deaths in NS	Decedents who were PCP enrollees
Cancer	32.2%	80.4%
Cardiovascular Disease	32.2%	11.9%
COPD	11.5%	7.9%
Pneumonia	11.7%	6.3%
Dementia	10.2%	3.5%
Diabetes	10.6%	5.9%
Renal Disease	8.8%	6.5%

Decedents were being enrolled in a PCP at an increasing rate of 1% point per year. In 1996, less than 20% of the decedents were PCP enrollees. By 2009, 34.5% were PCP enrollees. Increases occurred for both cancer and non-cancer causes of death (1.7% and 0.09% points per year, respectively).

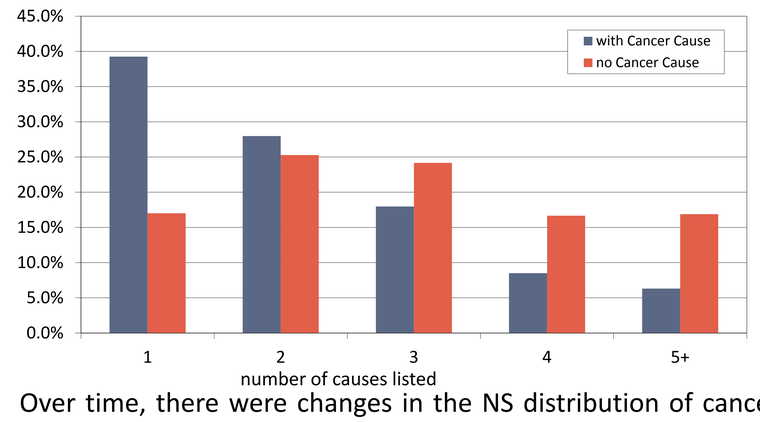
Figure 1: Percent with Cancer/Non-Cancer Causes of Death Enrolled in PCP Over Time



Overall, PCP enrollees had 2.3 mean causes of death. Without cancer, they had more causes of death (mean= 3.0) than cancer decedents (mean=2.2); this pattern was observed in each PCP.

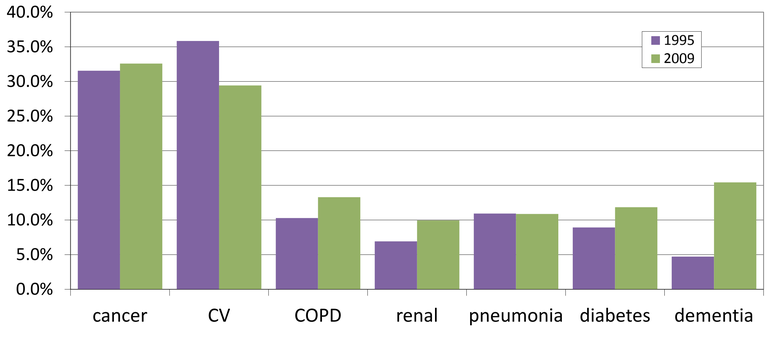
Overall, 65.2% of the PCP enrollees had more than one cause of death. Enrollees who were cancer decedents were more likely to have only one cause (39.3%), than five or more causes (6.3%) of death. In contrast, non-cancer PCP enrollees had an equal chance of one, four, or five or more causes (17%).

Figure 2: Number of causes of death on death certificate for PCP enrollees by cancer/non-cancer



Over time, there were changes in the NS distribution of cancer and non-cancer causes of death. Cardiovascular (CV) disease is recorded less frequently, and chronic obstructive pulmonary disease (COPD), renal disease, diabetes, dementia, and to a less extent cancer, more frequently. There was a 2% annual increase in the number of causes of death listed.

Figure 3: Comparison between 1995 and 2009 in percent of selected causes of death in Nova Scotia



Controlling for age, sex and PCP, cancer had a decreasing proportion of PCP enrollment over time [-8%; OR: 0.92, CI: 0.91-0.93]. Dementia showed the largest increase (13%; OR: 1.13, CI: 1.10, 1.16]. PCP enrollees with dementia were more likely to be older, female, and in either the CEH or CB PCP. The opposite pattern was observed for PCP enrollees with cancer. PCP enrollment decreases with age and is less for men among cancer decedents, with the reverse trend observed for those with a non-cancer cause of death. The more rural PCPs (CEH, CB) were more likely than CH to see persons with non-cancer causes of death.

Table 3: Logistic probability of enrollment in PCP by cause of death

Disease	Odds Ratios [Confidence Interval]				
	Year trend	**Age (years)**	**Sex (F/M)**	**CEH to CH**	**CB to CH**
Cancer	0.92*** [0.91-0.93]	0.96*** [0.95-0.96]	0.84*** [0.77-0.90]	0.75*** [0.66-0.86]	0.74*** [0.68-0.80]
Pneumonia	0.99 [0.98-1.01]	0.89*** [0.79-1.01]	0.89* [0.79-1.01]	1.27** [1.03-1.56]	0.95 [0.83-1.09]
CV	1.03*** [1.02-1.04]	1.06*** [1.06-1.07]	0.77*** [0.70-0.84]	1.31*** [1.12-1.53]	1.30*** [1.18-1.44]
COPD	1.04*** [1.02-1.05]	1.04*** [1.03-1.04]	0.65*** [0.58-0.73]	1.59*** [1.33-1.90]	1.59*** [1.41-1.78]
Diabetes	1.05*** [1.03-1.07]	1.02*** [1.01-1.03]	0.81*** [0.72-0.92]	1.56*** [1.27-1.92]	1.56*** [1.36-1.78]
Renal	1.06*** [1.04-1.07]	1.03*** [1.03-1.04]	0.79*** [0.70-0.89]	0.76** [0.61-0.95]	0.92 [0.81-1.06]
Dementia	1.13*** [1.10-1.16]	1.10*** [1.09-1.11]	1.48*** [1.25-1.75]	1.71*** [1.36-2.16]	1.36*** [1.14-162]
Without Cancer	1.09*** [1.08-1.10]	1.05*** [1.04-1.05]	1.20*** [1.11-1.29]	1.33*** [1.17-1.51]	1.36*** [1.25-1.47]

Statistically significant: *** 99%, ** 95%, and * 90% confidence
Note: Causes of death are not mutually exclusive, i.e. decedent can have more than one of cause of death

Controlling for age, sex and PCP, the decreasing probability of cancer is shown in Figure 4, and the increasing probability of non-cancer causes of death in Figure 5.

Probability of cause of deaths of PCP enrollees, controlling for age, sex and PCP

Figure 4: Cancer

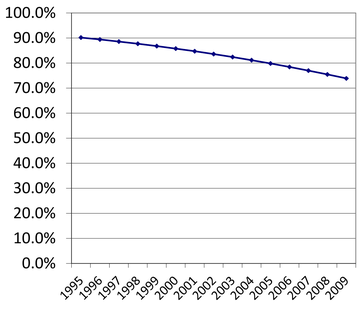
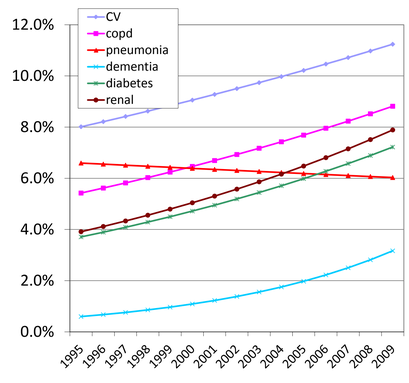


Figure 5: Non cancer



Conclusions

Increasingly, PCP enrollees are more likely to have a disease other than cancer. An increase in multiple co-morbidities is also noted. These trends affect palliative service requirements, with the increase in dementia of particular concern. As our population continues to age, and palliative needs of persons dying with conditions other than cancer are being recognized, these trends will continue. Collaboration with disease programs and primary care is advised to handle future demands.

Acknowledgement

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