The use of linked data to better understand health inequities: The story of lung cancer and Indigenous people in NSW

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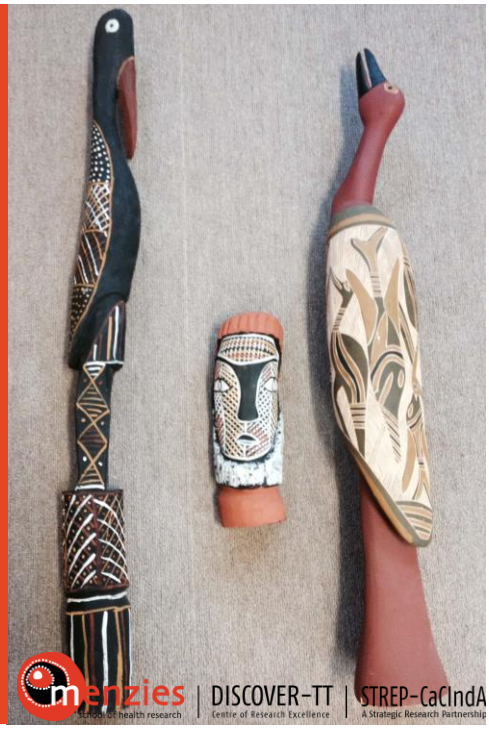


Overview

- Lung cancer is the most common incident cancer in the world and the most common cause of cancer death in Australia
- It is a high fatality disease
- Unable to be routinely screened
- Despite this, lung cancer disparities still exist:
  - Mortality by Indigenous status is higher
  - Mortality by socioeconomic status higher for the most disadvantaged categories when compared to the least disadvantaged categories
  - Rural and remote people are less likely than urban people to receive timely treatment
- Nationally, 77% of Indigenous people live outside major city areas
- Higher proportion of Indigenous people (31%) are in the lowest socioeconomic decile than non-Indigenous people (9%)

Are known disparities the same if we compare them across different sub-population categories?

Measuring disparities – what's intersectionality got to do with it?

- Differences can be conceptualised in different ways:
  - Psychosocial theory; theory of fundamental causes; eco-social theory; life course perspective; social selection theory and **intersectionality theory**
- Disparities can be measured in different ways:
  - Combined effect: Include all sub-populations within the primary model and adjust for relevant variables
  - Independent effect: Removing each sub-population from the model to assess for any variations or clear confounding
  - Intersecting effect: Developing independent dummy variables for each potentially interacting sub-population category
  - Stratification effect: Stratifying sub-populations to assess how a category of one sub-population is shaped by the category of another sub-population
- Disparities can be measured in terms of absolute differences and relative differences
- The choice of measure can result in different results

Aim

To better understand lung cancer disparities in NSW

In a population-based sample of people with lung cancer in NSW we investigated associations among:

- Indigenous status
- Socioeconomic disadvantage
- Geographic remoteness

Methods

Study participants

- All people with a primary lung cancer diagnosis in NSW >15yrs from January 2001 to December 2007

Data

- The NSW Central Cancer Registry was linked to the Admitted Patients Data Collection, cause of death data from the NSW Registry of Births, Deaths and Marriages and the Cause of Death Unit Record File from the Australian Bureau of Statistics
- Probabilistic record linkage of the data sets was done by the NSW Centre for Record Health Linkage who provided a de-identified Master Linkage Key for each individual record

Methods – sub-populations

Indigenous status

- Indigenous status was based on a 'single identification' algorithm

Socioeconomic disadvantage

- 2001 Index of Relative Socioeconomic Advantage and Disadvantage
- Composite measure of income level, education level and employment status

Geographic Remoteness

- 2001 Accessibility/Remoteness Indexes of Australia (ARIA+)
- Measure of remoteness based on accessibility to service centres

Sub-population categories

Indigenous status

1. Non-Indigenous (REF)
2. Indigenous

Socioeconomic disadvantage

1. Least Disadvantaged (REF)
2.
3.
4.
5. Most Disadvantaged

Geographic remoteness

1. Major city (REF)
2. Inner regional
3. Outer regional/remote/very remote

Other variables

- Sex
- Age category
- Degree of spread

- COPD
- Other comorbidities excluding COPD
- Morphology

Methods – Indicators

Incidence & mortality

- Crude and age-standardised rates
  - 2001 Australian Estimated Resident Population
- Negative binomial regression models
  - Heuristic approach

Treatment

- Patients were assigned into either 'received' or 'did not receive' :
  - 1) surgical treatment and
  - 2) concordant evidence-based surgical treatment
    - Algorithm developed using NHMRC endorsed guidelines

Survival

- Survival proportions at 1, 3 and 5years
- Kaplan-Meier estimator
- Cox proportional hazards models
  - Cox extension (age, morphology, spread of disease, COPD and comorbidities without COPD)

All analysis undertaken in Stata V.14 for Windows

Results - overview

	Indigenous (n=346)		Non-Indigenous (n= 20500)	
	n	percent+ (95% CI)	n	percent+ (95% CI)
Sex				
Male	194	56.1 (50.8-61.2)	12951	63.2 (62.5-63.8)
Female	152	43.9 (38.8-48.2)	7549	36.8 (36.2-37.5)
Age at diagnosis				
Median age (years)	*60*		*70*	
Socioeconomic disadvantage				
Least disadvantaged	23	6.6 (4.4-9.8)	3442	16.8 (16.3-17.3)
2	30	8.7 (6.1-12.2)	3869	18.9 (18.3-19.4)
3	52	15.0 (11.6-19.2)	3941	19.2 (18.7-19.8)
4	69	19.9 (16.0-24.5)	4149	20.2 (19.7-20.8)
Most disadvantaged	172	49.7 (44.4-55.0)	5099	24.9 (24.3-25.5)
Remoteness				
Major city	128	37.0 (32.0-42.2)	14138	69.0 (68.3-69.6)
Inner regional	128	36.1 (31.2-41.4)	4844	23.6 (23.1-24.2)
Outer regional/ remote/very remote	93	26.9 (22.4-31.8)	1518	7.4 (7.1-7.8)
Cancer type				
Non-small cell lung cancer	293	84.7 (80.5-88.1)	18093	88.3 (87.8-88.7)
Small cell lung cancer	53	15.3 (11.9-19.5)	2407	11.7 (11.3-12.2)
Degree of spread				
Local	79	22.8 (18.7-27.6)	4621	22.5 (22.0-23.1)
Regional	67	19.4 (15.5-23.9)	3383	16.5 (16.0-17.0)
Distant	120	34.7 (29.8-40.0)	7370	36.0 (35.3-36.6)
Unknown	80	23.1 (19.0-27.9)	5126	25.0 (24.4-25.6)

Take away results

Higher proportion of Indigenous females diagnosed

Indigenous people diagnosed 10 years younger

Indigenous people have greater socioeconomic disadvantage

Non-Indigenous people live in major cities

Not much variation in lung cancer morphology or degree of spread

Results - Incidence

Standardised Incidence rates

- Non-Indigenous 52.5 (CI:51.8-53.2)
- Indigenous 106.8 (CI:93.4-120.2)

Combined effects IRR

- Indigenous IRR 1.96 ($p<0.001$)

Disadvantage stratification IRR

- Indigenous IRR in the least disadvantaged group 0.87 (p0.5292)
- Indigenous IRR in the most disadvantaged group 4.27 ($p<0.001$)

Remoteness stratification IRR

- Indigenous IRR in major city 1.16 (p0.1102)
- Indigenous IRR in outer regional/remote/very remote 7.70 ($p<0.001$)

Take away incidence results

Incidence rates almost twice as high for Indigenous people after adjusting for socioeconomic disadvantage and remoteness

When stratified by other sub-population groups large disparities present for Indigenous people in higher disadvantaged groups and Indigenous people living outside major cities

Results - Treatment

- 523 people received surgical treatment of which 7 were Indigenous
- 1.2% (CI:0.3-4.7) of Indigenous people eligible for evidence based surgery received evidence based treatment compared to 2.9% (CI:2.6-3.2) of non-Indigenous people

Take away treatment results

Lower proportion of Indigenous people had evidence based curative surgical treatment than non-Indigenous people

Less than 0.1% of the total treatment population were Indigenous restricting an intersectionality assessment by other sub-populations

Results - Survival

Combined effects HR

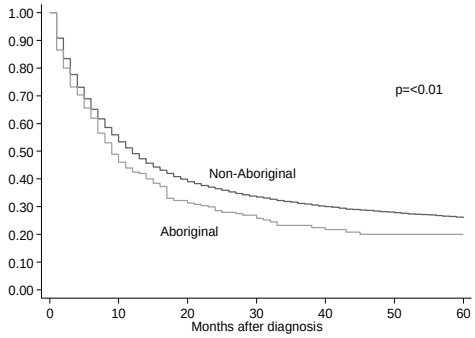
- Indigenous HR 1.38 ($p<0.001$)

Disadvantage stratification HR

- Indigenous HR in the least disadvantaged group 2.14 ($p<0.001$)
- Indigenous HR in the most disadvantaged group 1.39 ($p<0.001$)

Remoteness stratification HR

- Indigenous HR in major city 1.53 ($p<0.001$)
- Indigenous HR in outer regional/remote/very remote 1.28 ($p0.13$)



Take away survival results

Survival is lower for Indigenous people

When stratified by other sub-population groups, Indigenous hazard continued to be higher

Results - Mortality

Standardised mortality rates

- Non-Indigenous 25.6 (CI:25.2-25.9)
- Indigenous 52.9 (CI:46.2-59.5)

Combined effects MRR

- Indigenous MRR 2.02 ($p<0.001$)

Disadvantage stratification MRR

- Indigenous MRR in the least disadvantaged group 0.86 ($p0.4809$)
- Indigenous MRR in the most disadvantaged group 4.23 ($p<0.001$)

Remoteness stratification MRR

- Indigenous MRR in major city 1.14 ($p0.1491$)
- Indigenous MRR in outer regional/remote/very remote 7.74 ($p<0.001$)

Take away mortality results

Mortality rates over twice as high for Indigenous people after adjusting for socioeconomic disadvantage and remoteness

When stratified by other sub-population groups mortality was more than four times higher for Indigenous people in the most socioeconomically disadvantaged group and up to almost eight times higher for Indigenous people living outside major cities

Conclusion

Identifying ways in which sub-populations can independently and collectively determine disparities is critical when aiming to understand and reduce health disparities

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