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# BMJ Open

## Protocol for assessment of demographic, epidemiological, and clinical profile of decentralised cancer patients at Nelson Mandela Academic Hospital and Rob Ferreira Hospital, South Africa

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1 **Protocol for assessment of demographic, epidemiological, and clinical profile of**  
2 **decentralised cancer patients at Nelson Mandela Academic Hospital and Rob Ferreira**  
3 **Hospital, South Africa**

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## 29 **ABSTRACT**

### 30 **Introduction**

31 Cancer is the second leading cause of death globally. However, cancer care services are often  
32 concentrated in urban centres. Two of South Africa's hospitals have decentralised cancer care  
33 delivery from 2019. This study aims to describe the baseline demographic, epidemiological  
34 and clinical profile of various cancers at Nelson Mandela Academic hospital (NMAH) and Rob  
35 Ferreira hospital (RFH), in South Africa's Eastern Cape and Mpumalanga provinces  
36 respectively.

### 37 **Methods and analysis**

38 This study will be conducted in the Eastern Cape and Mpumalanga provinces. A quantitative,  
39 descriptive, exploratory cross-sectional and an ambidirectional cohort study design will be  
40 undertaken to gain insight on the baseline characteristics of 424 randomly sampled patients  
41 treated for cancer at NMAH and RFH between the 01<sup>st</sup> of March 2019 and the 28<sup>th</sup> of February  
42 2022. A validated, researcher-administered survey questionnaire will be used to assess  
43 demographic characteristics, and prevalence of different cancers among patients. Concurrently,  
44 a document review will be undertaken on cancer patients using the patient registry to ascertain  
45 the duration of diagnosis, type of cancer(s), management plan and patient survival time.  
46 STATA version 16 will be used for data analysis. The Shapiro-Wilk test will be used to explore  
47 the distribution of numerical variables. The Chi-squared or Fisher's exact tests will be used  
48 depending on the value of the expected frequencies to compare categorical variables. Kaplan-  
49 Meier survival estimates will be used to determine the survival time. Hazard ratios will be used  
50 to determine the predictors of death. The level of statistical significance will be set at p-  
51 value  $\leq 0.05$ . The 95% confidence interval will be used for the precision of estimates.

### 52 **Ethics and dissemination**

53 Ethics approval was obtained from the Human Research Ethics Committee of Walter Sisulu  
54 University, South Africa (040/2020). Findings will be reported through peer-reviewed  
55 journal(s), presentations at conferences and at partner meetings.

56  
57 **Keywords:** Cancer, decentralised, referral, oncology; AND South Africa

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2  
3 58 **Strengths and limitations of this study**  
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- 5 59 ➤ This is the first study to formally report on decentralisation of cancer care services in  
6 South Africa.  
7 60  
8 61 ➤ Triangulation of designs compensates for the potential limitations of a single design  
9 and thus provide more insight on cancer care delivery models in the selected study sites.  
10 62  
11 63 ➤ The ambidirectional cohort design does not only enable the assessment of the survival  
12 time and predictors of death but also enables the retrospective and prospective follow-  
13 up of patients and thus understand their care plans better.  
14 64  
15 65  
16 66 ➤ The study could be limited by the quality of data or poor information systems thus  
17 resulting in missing data.  
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## 69 INTRODUCTION

70 Cancer is considered to be the number two cause of death globally, accounting for an estimated  
71 9.6 million deaths.<sup>1 2</sup> Africa has the second lowest cancer related deaths contributing 7.1% to  
72 the total cancer deaths globally.<sup>3</sup> Of all cancers, breast cancer has the highest incidence (12.5%)  
73 followed by lung cancer (12.2%); colorectum cancer (10.7%); prostate cancer (7.8%); stomach  
74 cancer (6%); liver cancer (5%); cervical cancer (3.3%); oesophageal cancer (3.3%) with other  
75 cancers accounting for 39.1%.<sup>4</sup> Of all the over 9.8 million global cancer related deaths in 2015,  
76 lung cancer accounted for the highest mortality rate with 18.2% followed by; colorectum  
77 cancer (9.5%); liver cancer (8.4%); stomach cancer (7.8%); breast cancer (6.9%); oesophagus  
78 cancer (5.5.5%); pancreatic cancer (4.7%); prostate cancer (3.8%) and other cancers (35.3%).<sup>3</sup>  
79 Cancer is expected to continue to rise as part of the epidemiological transition globally, further  
80 straining limited healthcare resources.<sup>1</sup> Signs of this prediction have become more visible with  
81 rapidly growing global cancer incidence and mortality rates.<sup>4</sup>

82 A significant proportion of diagnosed cancers are preventable and may be substantially reduced  
83 through mitigation of known risk factors.<sup>2</sup> For example, lifestyle related risk factors could be  
84 reduced through behaviour changes including the cessation of tobacco use, reducing alcohol  
85 consumption, avoiding high fat and low fibre diet, improve physical activity, avoid obesity,  
86 and prevent sun exposure.<sup>5</sup> Other risk factors may be reduced through improved awareness of  
87 occupational exposure to environmental risk factors.<sup>5</sup> Approximately a third of cancer deaths  
88 are due to behavioural and dietary risks, such as, high body mass index, low fruit and vegetable  
89 intake, lack of physical activity, tobacco use, and alcohol use.<sup>6</sup> Smoking being the most  
90 common preventable cause of premature mortality worldwide contributes to almost 30% of all  
91 cancers in high income countries (HICs)<sup>7</sup>. While heavy alcohol drinking is a known cause of  
92 liver cancer and it also has links to other cancers such as, cancer of the airway and digestive  
93 tracts, breast, and colon<sup>8</sup>.

94 In South Africa cancer is a growing national health and socio-economic concern.<sup>5</sup> According  
95 to the International Agency for Research on Cancer (IACR), in 2020, there were 108 168 new  
96 cancer cases in South Africa bringing the risk of developing cancer before the age of 75 years  
97 to 20.7% (23.6 % male and 18.7% female).<sup>9</sup> In the same year, 56 802 deaths were reported,  
98 bringing the risk of dying from cancer before the age of 75 years to 11.8% (13.9% male and  
99 10.4% among female).<sup>9</sup> According to the 2017 national cancer strategic framework of South  
100 Africa,<sup>5</sup> the increasing incidence and the mortality rate presents a huge challenge to those

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2  
3 101 affected patients and families who are directly affected by the disease especially those who  
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5 102 have limited access to care.<sup>5</sup>  
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7 103 In 2016, the top five cancers affecting women in South Africa were, breast cancer (27.1%),  
8 104 cervical cancer (18.7%); colorectal cancer (6.3%); lung cancer (4.9%) and cancer of the uterus  
9 105 (3.9%), while the top five cancers affecting men were, prostate cancer (25.8%); lung cancer  
10 106 (12%); colorectal cancer (7.3%); Kaposi sarcoma (4.9%) and non-Hodgkin's lymphoma  
11 107 (4.1%).<sup>4</sup>  
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16 108 The Nelson Mandela Academic Hospital (NMAH) and Rob Ferreira Hospital (RFH) in the  
17 109 Eastern Cape and Mpumalanga provinces respectively embarked on a decentralised model of  
18 110 cancer care delivery from 01 March 2019. The two hospitals aim to establish centres of  
19 111 excellence in Cancer Care, a network of cancer care satellite sites at district hospital level and  
20 112 community-based cancer care services. The primary goal is to ensure that patients requiring  
21 113 cancer care are able to get their quality care closer to where they live, health professionals are  
22 114 able to screen and diagnose early, unnecessary delays to treatment are reduced and patients get  
23 115 quality palliative care closer to home. Secondary goals include reducing long distance travelled  
24 116 when seeking cancer care, reducing costs of seeking cancer care and reducing unnecessary  
25 117 and/or late referral of cancer patients. However, due to limited resources the current  
26 118 decentralised model of care is only limited to patients requiring chemotherapy. It is hoped that  
27 119 there will be improvement in the patient experience and quality of cancer care and, reduction  
28 120 of morbidity and mortality through the implementation of the decentralised model of cancer  
29 121 care. However, data on patient demographic characteristics and, epidemiological and clinical  
30 122 profile of various cancers is lacking in these two hospitals. This study therefore seeks to  
31 123 conduct a baseline assessment of demographic, epidemiological and clinical profile of various  
32 124 cancers in NMAH and RFH.  
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#### 46 125 **Significance**

  
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49 126 South Africa's cancer services are generally urban-based and located in tertiary and quaternary  
50 127 health centres with an underdeveloped cancer service platform at district hospital and primary  
51 128 care levels. This means that patients needing cancer care have to travel long distances to big  
52 129 cities/towns in order to access basic cancer care. This creates gaps in access and quality of  
53 130 cancer care delivery between urban areas and rural areas. It is therefore envisaged that this  
54 131 study will provide insight on the distribution and types of cancers in areas where there is  
55 132 currently an underestimation of the burden of disease and as a result incorrect understanding  
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3 133 of the levels of risk within the local populations. Moreover, establish the extent of the problem  
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5 134 in both health facilities and possibly justify the need for decentralisation of cancer care services  
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7 135 and help inform cancer preventive strategies in South Africa and other similar settings.  
8

9 136

## 11 137 **Objectives**

- 14 138 - To describe the socio-demographic characteristics of patients diagnosed with cancer in  
15 139 selected hospitals in the Eastern Cape and Mpumalanga provinces, South Africa.
- 17 140 - To determine and compare the incidence rate and prevalence of different types of cancer in  
18 141 the selected hospitals.
- 21 142 - To determine and compare the geographic distribution of cancers in the Eastern Cape and  
22 143 Mpumalanga provinces of South Africa.
- 24 144 - To determine the gaps between symptom development, first presentation at a health  
25 145 institution, first cancer diagnosis, referral for definitive management and initiation on  
26 146 treatment of patients diagnosed with cancer in South Africa's Eastern Cape and  
27 147 Mpumalanga provinces.
- 31 148 - To determine the comorbid conditions of patients with a cancer diagnosis in South Africa's  
32 149 Eastern Cape and Mpumalanga provinces.
- 34 150 - To determine the survival time of patients diagnosed with cancer in South Africa's Eastern  
35 151 Cape and Mpumalanga provinces.

## 38 152 **METHODS AND ANALYSIS**

### 40 153 **Research design**

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44 154 This study will utilise a quantitative approach with a triangulation of a descriptive, exploratory  
45 155 cross-sectional and a longitudinal cohort design to answer the study objectives. The  
46 156 triangulation of designs compensates for the potential limitations of a single design. This study  
47 157 forms part of a bigger but yet to be published research project titled: "Exploring the feasibility,  
48 158 implications and outcomes of decentralising cancer care delivery in the Eastern Cape and  
49 159 Mpumalanga provinces of South Africa".

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55 160 Information will be sourced through two quantitative sub-studies, a cross-sectional survey with  
56 161 cancer patients and an ambi-directional cohort document review. Below is a brief description  
57 162 of the two sub-studies.  
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163 Sub-study 1: Quantitative cross-sectional study

164 A quantitative survey questionnaire will be administered on patients to assess demographic  
 165 characteristics, prevalence of different cancers in selected hospitals and, compare geographic  
 166 distribution of cancers in the Eastern Cape and Mpumalanga provinces.

167 Sub-study 2: Quantitative ambidirectional cohort study design

168 Using the cancer patient registry used in the study sites, a document review will be carried out  
 169 on cancer patients to ascertain the duration of cancer diagnosis, type of cancer(s), and the  
 170 duration of survival since admission to the oncology clinic (survival time). Figure 1 shows the  
 171 ambi-directional component of the study.

172 **Table 1** below summarises the two sub-studies.

173 **Table 1: Research methods summary**

Sub-study	Study design	Objectives	Analysis
1	Cross-sectional study	<ul style="list-style-type: none"> <li>- Describe socio-demographic characteristics of patients.</li> <li>- Determine and compare the geographic distribution of cancers.</li> <li>- Determine cancer disease progression.</li> <li>- Determine comorbid conditions of cancer patients.</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency tables, percentages, and graphs to summarise categorical variables.</li> <li>• Mean, standard deviation and range to summarise normally distributed numerical variables; or Median and interquartile range to summarise skewed numerical variables.</li> </ul>
2	Ambidirectional cohort study (document review)	<ul style="list-style-type: none"> <li>- To determine and compare the incidence rate and prevalence of different types of cancer in the selected hospitals.</li> <li>- To determine the comorbid conditions of patients with a cancer diagnosis.</li> </ul>	<ul style="list-style-type: none"> <li>• Chi-squared statistics or Fisher's exact test to compare categorical variables between groups.</li> </ul>

		<p>- To determine the survival time of patients diagnosed with cancer.</p>	<ul style="list-style-type: none"> <li>• Parametric and/or non-parametric tests to compare numerical variables between groups.</li> <li>• Kaplan-Meier survival estimates, for survival time.</li> <li>• Hazard ratios for predictors of death.</li> </ul>
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### 175 **Study setting**

176 The study is located in two rural provinces with a high degree of under-development and  
 177 marginalisation, namely Eastern Cape and Mpumalanga provinces in South Africa.<sup>10</sup>  
 178 Generally, Eastern Cape and Mpumalanga provinces are characterised by lack of the necessary  
 179 infrastructure, resources, and expertise to provide quality, safe and accessible radiotherapy,  
 180 chemotherapy, palliative care services and surgical oncology services. Patients from rural  
 181 communities, who generally cannot afford private healthcare and are dependent on state health  
 182 services for cancer care, are compelled to travel long distances to the urban-based tertiary or  
 183 quaternary cancer care centres in order to access cancer care. The study will be conducted in  
 184 two hospitals, Nelson Mandela Academic Hospital (NMAH) in Mthatha, Eastern Cape and  
 185 Rob Ferreira Hospital (RFH) in Mbombela, Mpumalanga respectively. NMAH is one of ten of  
 186 South Africa's central hospitals and is the only one that is located in a rural area. This level of  
 187 care is meant to be a quaternary level of care. RFH is a tertiary level of care hospital.

188 These are two hospitals in their respective provinces that refer their patients to seek quality  
 189 cancer care in hospitals which are farther away. At times, it takes patients up to 3-days of  
 190 traveling when attending to their cancer care appointments. For example, cancer patients from  
 191 Mpumalanga's Rob Ferreira Hospital travel more than 400 kilometres to country's capital city,  
 192 Pretoria. While cancer patients from the Eastern Cape's Nelson Mandela Academic Hospital  
 193 travel more than 200 kilometres to East London to access quality cancer care at an urban-based  
 194 tertiary hospital. An anomaly, as NMAH is statutorily a level of care higher than a tertiary

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3 195 hospital. The study hospitals have been selected based on their levels of care, gazetted specialist  
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5 196 packages of care and concerns about the existing package of cancer care services.  
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### 7 197 **Population and Sampling**

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10 198 A triangulation of approaches will be used to select study participants from the two hospitals.  
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12 199 The study hospitals have been purposely selected because they are currently implementing a  
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14 200 decentralised model of cancer care delivery. Furthermore, the two hospitals aim to establish  
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16 201 centres of excellence in cancer care, a network of cancer care satellite sites at district hospital  
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18 202 level and community-based cancer care services.

19 203 Sub-study 1: Quantitative cross-sectional study (patients)

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21 204 Systematic random sampling of patients visiting the oncology clinics' outpatient's department  
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23 205 will be conducted by approaching every 5<sup>th</sup> patient on the queue until the sampling size has  
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25 206 been reached. A total combined sample size for the two hospitals will be calculated using the  
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27 207 equation,  $n = \frac{p(1-p)z^2}{d^2}$  for a one-sided 95% confidence interval and a 5% significance level  
28  
29 208 ( $z=1.96$ ). Because the proportion (p) of cancer patients who are seen in the respective hospitals  
30  
31 209 is not known, this (p) will be set at 50% and the margin of error (d) will be set at 5%. This  
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33 210 thus yields a total minimum sample size of 385. To factor for data entry errors a further 10%  
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35 211 (39) will be added to yield a desired sample size of 424 participants for the two sites.  
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37 212 Participants will then be recruited proportionally to yield a sample size of 212 end-user  
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39 213 participants per site.

40 214 Sub-study 2: Quantitative ambi-directional cohort (document review)

41  
42 215 Information will be extracted from the patient registry to respond to the questions on the  
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44 216 extraction tool. All patients under the care of the unit at any stage between the 01<sup>st</sup> of March  
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46 217 2019 and the 28<sup>th</sup> of February 2022 will be included.

### 47 48 218 **Data collection**

49  
50 219 A multi-method approach to data collection will be adopted to get a comprehensive picture  
51  
52 220 on cancer in the selected hospitals in terms of demographic distribution of cancer, socio-  
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54 221 economic characteristics, prevalence, duration of diagnosis, etc. This approach will also  
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56 222 compensate for the potential limitations of a single data collection method and to triangulate  
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58 223 the data as a means of checking the consistency of the study findings.

59 224 Sub-study 1: Quantitative cross-sectional study (patients)

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3 225 The aim of this survey is to assess socioeconomic demographic characteristics of cancer  
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5 226 patients, prevalence of different cancers in selected hospitals, compare geographic distribution  
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7 227 of the different cancers from the end-user's perspective. This sub-study will adopt and utilise  
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9 228 a standardised and validated quantitative survey tool (Appendix A) to collect data from  
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11 229 patients. This instrument asks questions on, demographical data and epidemiological and  
12  
13 230 clinical profile of various cancers. This questionnaire will be translated into local languages  
14  
15 231 such as isiXhosa, siSwati, and isiZulu to accommodate participants who might not be  
16  
17 232 comfortable with English.

18 233 Sub-study 2: Quantitative ambidirectional cohort study (document review)

19  
20 234 Using a data extraction tool (Appendix B), a document review will be conducted in addition  
21  
22 235 to the survey questionnaire. The main aim of the document review is to ascertain information  
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24 236 which could not be captured or verified from the survey questionnaire, including, duration of  
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26 237 cancer diagnosis, types of cancer, and survival time of cancer patients from the date of  
27  
28 238 diagnosis.

### 29 239 **Data management and analysis**

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31 240 Quantitative data analysis will include capturing survey data into Microsoft Excel Office 2016  
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33 241 and exporting the data into STATA version 16.1 (STATA Corp, College Station, Texas, USA)  
34  
35 242 for analysis. Some descriptive and categorical data will be compared using frequencies,  
36  
37 243 percentages, and graphs. Numerical data will be explored for normality using the Shapiro-Wilk  
38  
39 244 test.<sup>11</sup> If normally distributed the mean, range and standard deviation will be used. If not  
40  
41 245 normally distributed, then the median, and interquartile range (IQR) will be used. The  
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43 246 Wilcoxon rank sum or an appropriate two-sample t-test will be used to compare the mean or  
44  
45 247 median age of cancer patients by cancer type and between the two sites depending on the  
46  
47 248 normality of the distribution of age and/or the equality of variances. A test for the equality of  
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49 249 variances will be performed before use of the two-sample t-tests, if numerical variables are  
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51 250 normally distributed. The two-sample t-test for independent samples will be carried out if  
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53 251 variances are equal, and Satterthwaite's modified t-test used if the variances are not equal. The  
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55 252 Chi-squared or Fisher's exact tests will be used depending on the value of the expected frequencies. If  
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57 253 expected frequencies are <5 in binary comparisons or if any one cell of a larger comparison  
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59 254 has an expected frequency of <1 or more than 20% of the cells of nominal categorical  
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255 comparisons have an expected frequency of <5 then the Fisher's exact test will be used.  
256 Kaplan-Meier survival estimates will be used to determine the survival time. Hazard ratios will

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3 257 be used to determine the predictors of death. The level of statistical significance will be set at  
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5 258 p-value  $\leq 0.05$ . The 95% confidence interval will be used for the precision of estimates.  
6

### 7 259 **Patient and public involvement**

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9 260 The planning of the cancer service expansion involved community representatives through  
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11 261 hospital boards in workshops and meetings. Patients will be informed of the study at all stages  
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13 262 through consultations and public notices in the study sites.  
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### 15 263 **Ethics and dissemination**

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17 264 ee-00000 Access approval has been obtained from the Provincial Health Research Committees  
18  
19 265 of the Eastern Cape (EC\_202010\_012) and Mpumalanga (MP\_202011\_002) provinces  
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21 266 respectively. The study will abide by the 4 ethical principles of autonomy, beneficence, non-  
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23 267 maleficence, and justice. Participants will be informed that their participation in this study is  
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25 268 voluntary and that their confidentiality will be maintained throughout the study. Participants  
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27 269 will also be assured that they are free to withdraw at any stage of the study and could opt-out  
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29 270 of questions that they are not comfortable with. All identifying information will be removed.  
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31 271 All electronic records will be accessed through a password encrypted database that only the  
32  
33 272 principal investigator has access to. No direct incentives will be issued to participants. Before  
34  
35 273 initiating the self-administered questionnaires, informed consent forms will be signed by all  
36  
37 274 study participants. A waiver of consent has been attained for the document review. Information  
38  
39 275 sheets and consent forms will be translated into relevant local languages (isiXhosa, Siswati and  
40  
41 276 isiZulu). They will also be assured that data collected will be used only for the purposes of the  
42  
43 277 study.  
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46 278 Findings of the study will be disseminated widely to all stakeholders, including participants;  
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48 279 and will be used to inform both provincial and national strategies to expand and sustain  
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50 280 provision of high-quality cancer screening, diagnosis, treatment, and palliative services, and  
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52 281 promote community-based cancer care programmes. Results will be presented at annual partner  
53  
54 282 meetings, national and international conferences. Results will also be published in open access  
55  
56 283 peer-reviewed journals to facilitate broad access to findings.  
57

58 284

### 59 285 **Authors' contributions**

60 286 WC conceived the research, sourced funding, engaged stakeholders, completed the first draft  
of the manuscript and jointly approved final draft. ORM edited and commented on versions of

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3 288 the manuscript and incorporated and addressed feedback from the co-authors. SAM edited  
4  
5 289 versions of the manuscript, provided methodological strategy and jointly-approved final draft.  
6  
7 290 ZJ is the content expert, edited and commented on versions of the manuscript. BS facilitated  
8  
9 291 ethics and research access approvals, edited version of the manuscript. VE, DH, LG, NW, CZ,  
10  
11 292 LB, SK, JN, SS, OG and AM edited versions of the manuscript.

12  
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16

17 **295 Competing interests**

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20 296 None declared  
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299 **REFERENCES**

- 300 1. Fitzmaurice C, Abate D, Abbasi N, et al. Global, Regional, and National Cancer Incidence,  
301 Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-  
302 Years for 29 Cancer Groups, 1990 to 2017: A Systematic Analysis for the Global Burden  
303 of Disease Study. *JAMA Oncol* 2019;5(12):1749-68. doi: 10.1001/jamaoncol.2019.2996  
304 [published Online First: 2019/09/29]
- 305 2. World Health Organisation. Cancer factsheet Geneva: WHO; 2020 [cited 2021 01 June].  
306 Available from: <https://www.who.int/news-room/fact-sheets/detail/cancer> accessed 01 June  
307 2021.
- 308 3. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN  
309 estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer*  
310 *J Clin* 2018;68(6):394-424. doi: 10.3322/caac.21492 [published Online First: 2018/09/13]
- 311 4. Ferlay J, Colombet M, Soerjomataram I, et al. Estimating the global cancer incidence and  
312 mortality in 2018: GLOBOCAN sources and methods. *Int J Cancer* 2019;144(8):1941-53.  
313 doi: 10.1002/ijc.31937 [published Online First: 2018/10/24]
- 314 5. South African National Department of Health. The National Cancer Strategic Framework  
315 2017 – 2022. Pretoria: NDOH, 2017.
- 316 6. Ott JJ, Ullrich A, Mascarenhas M, et al. Global cancer incidence and mortality caused by  
317 behavior and infection. *J Public Health (Oxf)* 2011;33(2):223-33. doi:  
318 10.1093/pubmed/fdq076 [published Online First: 2010/10/12]
- 319 7. Jha P. The hazards of smoking and the benefits of cessation: a critical summation of the  
320 epidemiological evidence in high-income countries. *Elife* 2020;9 doi: 10.7554/eLife.49979  
321 [published Online First: 2020/03/25]
- 322 8. Seitz HK, Becker P. Alcohol metabolism and cancer risk. *Alcohol Res Health* 2007;30(1):38-  
323 41, 44-7. [published Online First: 2007/08/28]
- 324 9. International Agency for Cancer Research. Globocan South Africa Geneva: WHO; 2020  
325 [cited 2021 01 June ]. Available from:  
326 <https://gco.iarc.fr/today/data/factsheets/populations/710-south-africa-fact-sheets.pdf>  
327 accessed 01 June 2021.
- 328 10. Statistics South Africa. Statistics by Place: Census 2011 Pretoria, South Africa: Statistics  
329 South Africa; 2020 [Available from: [http://www.statssa.gov.za/?page\\_id=964](http://www.statssa.gov.za/?page_id=964) accessed 08  
330 June 2021.
- 331 11. Vetter TR. Fundamentals of Research Data and Variables: The Devil Is in the Details.  
332 *Anesth Analg* 2017;125(4):1375-80. doi: 10.1213/ane.0000000000002370 [published  
333 Online First: 2017/08/09]



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5  
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7 338 of the participating hospitals and provinces for their assistance.  
8

9  
10 339 **Patient consent for publication**  
11

12 340 Not required as this is a protocol. Patients to give consent before enrolment into the study.  
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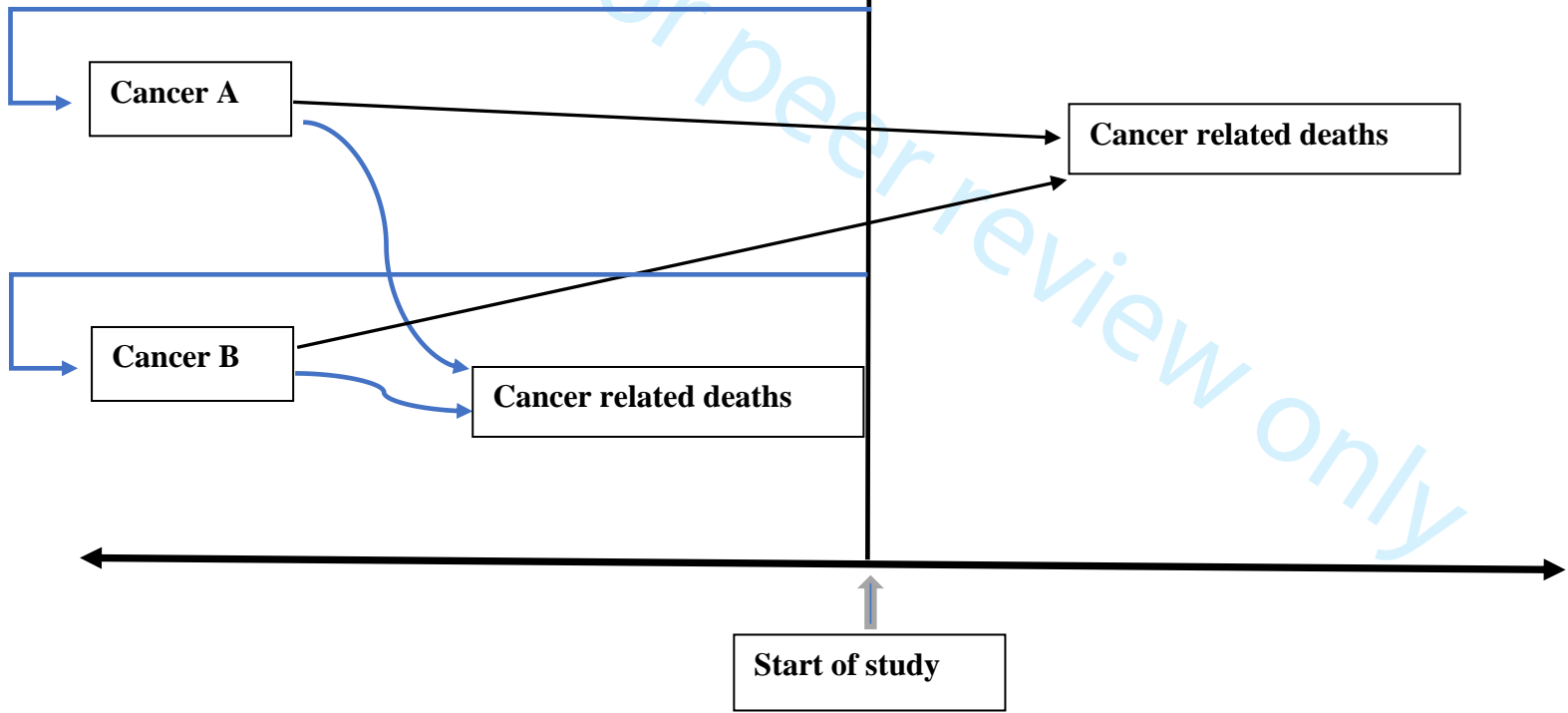
19 343 **Figure 1: Summary of ambi-directional cohort sub-study**  
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**Retrospective cohort**

**Prospective cohort**



**Appendix A**

Survey questionnaire (patients)

**INSTRUCTIONS:** Fill in the blank spaces with a tick where appropriate.**Date of Administration:** \_\_\_\_\_**Section 1: demographic profile**

## 1. Gender

1	Female	
2	Male	

## 2. Date of Birth

Dd/Mm/Yy: 

--	--	--	--	--	--	--	--	--	--

## 3. Ethnicity

1	African	
2	White	
3	Indian	
4	Coloured	
5	Other: specify	

## 4. Marital status

1	Never Married	
2	Married (including lobola)	
3	Divorced/Separated	
4	Widowed	
5	Cohabiting	

5. What is the highest standard/grade or level you have passed at school or tertiary education?

-----

6. Are you currently studying?

1	Yes	
2	No	

7. What is your current level of study? .....

8. Are you employed?

a)

1	Yes	
2	No	

b) If employed, what type of work do you do? .....

9. Source of income (tick all appropriate)

1	2	3	4	5	6	7	8	9
Job	Old Age Grant	Disability Grant	Other Pension	Spousal support	Support from children	Child support grant	None	Other (Specify)

10. What is your gross family income each month (that is, before tax)?

1	No income		7	R6 401 – R12 800	
2	R1 – R400		8	R12 801 – R25 600	
3	R401 – R800		9	R25 601 – R51 200	
4	R801 – R1 600		10	R51 201 – R102 400	
5	R1 601 – R3 200		11	R102 401 – R204 800	
6	R3 201 – R6 400		12	More than R204 800	

11. What is the name of your place of residence? .....

12. Which health facility referred you here (Name)?

.....

1  
2  
3 **Section 2: Epidemiological and clinical profile of various cancers**  
4

5 13a. Do you have a family history of cancer?  
6

7 1	2	3
8 Yes	9 No /	10 Unsure
11		

12  
13 13b. If yes to above, how are you related to the family member(s) who has the cancer diagnosis?  
14  
15 \_\_\_\_\_  
16 \_\_\_\_\_  
17

18 13c. What type of cancer(s) does the family member(s) have?  
19  
20 \_\_\_\_\_  
21 \_\_\_\_\_  
22 \_\_\_\_\_  
23

24 14. Do you smoke? (tick all appropriate)  
25

26 a)

27 1	Yes	
28 2	No	

29  
30  
31 b) If Yes, when did you start smoking?  
32

33 Year: \_\_\_\_\_  
34

35 c) On average, how many cigarettes do you smoke in a day? \_\_\_\_\_  
36

37 d) If No, have you ever smoked?  
38  
39

40 1	Yes	
41 2	No	

42  
43  
44 e) For how long did you smoke? \_\_\_\_\_  
45

46 f) How many did you smoke in a day? \_\_\_\_\_  
47  
48

49 1	Once	
50 2	Twice	
51 3	Three time	
52 4	More than 3 times	

g) Did you stop smoking?

1	Yes	
2	No	

h) How long ago did you stop smoking? \_\_\_\_\_

15. Do you drink alcohol?

a)

1	Yes	
2	No	

b) Did you drink alcohol before?

1	Yes	
2	No	

16. Do you exercise (physical) on a regular basis?

1	Yes	
2	No	

17. Have you ever worked in mines?

1	Yes	
2	No	

18. How long in years did you work in mines? -----

19. Which mines (tick all that apply)? -----

1	Gold	
2	Platinum	
3	diamond	
4	Coal	
5	Other (specify)	

20. Please indicate if your family has a history of any cancer/s below?

1	Breast cancer	6	Uterus cancer
2	Lung cancer	7	Colon cancer
3	Cervical cancer	8	Ovarian cancer
4	Prostate Cancer	9	Other (specify)
5	Oesophagus cancer	10	No history of cancer in my family

21. Before you were told you needed to go to hospital about cancer, how many times did you see other doctors or health professionals about the health problem caused by cancer?

		1x	2x	3x	4x	5x	Other
1	I visited my local clinic						
2	I visited my local hospital						
3	I saw my local private doctor						
4	I saw my traditional healer/doctor/ Isangoma						
5	Other (specify):						

22. How do you feel about the length of time you had to wait before your first appointment with a hospital doctor or clinic doctor?

1	I was seen as soon as I thought was necessary
2	I should have been seen a bit sooner

23. How long was it from the time you identified symptoms?

-----

-----

24. Did your symptoms get better or worse or were the same while you were waiting for your first appointment with a hospital doctor?

-----

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25. What type of cancer(s) were you diagnosed with?

-----

-----

26. When was your cancer(s) diagnosed?

-----

-----

27. What health problems or symptoms did you notice at first?

-----  
 -----  
 -----

28. Who first told you that you had cancer?

1	A hospital doctor	
2	A hospital nurse	
3	A GP (family doctor)	
4	Another health professional (specify) _____	
5	A friend or relative	
6	Nobody – I worked it out for myself	
7	Cannot remember	

29. When you were first told that you had cancer, had you been told you could bring a family member or friend with you?

1	Yes	
2	No	
3	It was not necessary	
4	I was told by phone or letter	
5	Don't know / Can't remember	
6	Other (specify) _____	

30. How do you feel about the way you were told you had cancer?

-----  
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30. Did you understand the explanation of what was found with you?

1	Yes	
2	No	

31. When you were told you had cancer, were you given written information about the type of cancer you had?

1	Yes	
2	No	



32. Before your cancer treatment started, were you given a choice of different types of treatment?

1	Yes	
2	No, but I would have liked a choice	
3	I was not given a choice because only one type of treatment was suitable for me	
4	Not sure / Can't remember	
5	Missing	

33. Do you think your views were taken into account when the team of doctors and nurses caring for you were discussing which treatment you should have?

1	Yes	
2	No	

34. Were the possible side effects of treatment(s) explained in a way you could understand?

1	Yes	
2	No	

35. Before you started your treatment, were you given verbal/written information about the side effects of treatment(s)?

1	Yes	
2	No	

36. Were you involved as much as you wanted to be in decisions about your care and treatment?

1	Yes	
2	No	

37a. During the last 12 months, have you had an operation (such as removal of a tumour or lump) at one of the hospitals named in the covering letter?

1	Yes	
2	No	
3	Not sure	

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2  
3 b. Before you had your operation, did a member of staff explain what would be done during the operation?  
4

1	Yes	
2	No	

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10 38. The last time you went into hospital for a cancer operation, was your admission date changed to a later date by the  
11 hospital?  
12

1	Yes	
2	No	

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19 39. Beforehand, were you given written/verbal information about your operation?  
20

1	Yes	
2	No	

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26 40. After the operation, did a member of staff explain how it had gone in a way you could understand?  
27

1	Yes	
2	No	

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33 41. As far as you know, was the hospital or your doctor that referred you for cancer treatment given enough information  
34 about your condition and the treatment you had at the hospital?  
35

1	Yes	
2	No	
3	Don't know / Can't remember	

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43 42. Do you think the doctors and nurses at your local hospital or clinic did everything they could to support you while you  
44 were in their care?  
45

1	Yes	
2	No	

## Appendix B

### Document review template

##	Date of birth	Province	Site	Child	Patient Classification	Referred patient	Referral Type	Internal Referral Department	Referring Hospital_Mpumalanga	-
1.										
2.										
3.										
4.										
5.										

##	Referring Hospital_EC	Referral Hospital	Gender	Race	Citizenship	Medical Aid	Postal code	Employed	Source of income	Specify Occupation	-
6.											
7.											
8.											
9.											
10.											

##	Previous work in mine	Number of Years worked in mines	Marital Status	Date of 1st oncology visit	Date of diagnosis	Cancer diagnosis 1	ICD10_Cancer diagnosis1	Cancer diagnosis1_Stage	Cancer diagnosis 2	ICD10_Cancer diagnosis2	-
11.											
12.											
13.											
14.											
15.											

##	Cancer diagnosis2_Stage	Cancer diagnosis3	ICD10_Cancer diagnosis3	Cancer diagnosis3_Stage	Chemotherapy	Onco_Drug1	Onco_Drug2	Neupogen	Hormonal Therapy	Blood Transfusion	-
16.											
17.											
18.											
19.											
20.											

##	Radiotherapy	PET_Bone Scan	Palliative Care	Social support	Psychological support	HIV	Hypertension	Diabetes Mellitus	COPD	Asthma	-
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##	Other Chronic Disease1_Name	Other Chronic Disease2_Name	Family history of cancer	Previous Smoker	Current Smoker	Number of years of smoking	Number of cigarettes smoked in a day	Weight in Kg	Height in Centimetres	Date_of_Current_Visit1	-
26.											
27.											
28.											
29.											
30.											

##	Follow-up Date1	RIP Date	Date_of_Current_Visit2	Follow-up Date2	---
31.					
32.					
33.					
34.					
35.					

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# BMJ Open

## A protocol of mixed-methods assessment of demographic, epidemiological, and clinical profile of decentralised cancer patients at Nelson Mandela Academic Hospital and Rob Ferreira Hospital, South Africa

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<b>Primary Subject Heading</b>:	Oncology
Secondary Subject Heading:	Health services research, Oncology
Keywords:	ONCOLOGY, Cancer pain < ONCOLOGY, CHEMOTHERAPY, Radiation

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1 **A protocol for mixed-methods assessment of demographic, epidemiological, and**  
2 **clinical profile of decentralised cancer patients at Nelson Mandela Academic**  
3 **Hospital and Rob Ferreira Hospital, South Africa**

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## 29 **ABSTRACT**

### 30 **Introduction**

31 Cancer is the second leading cause of death globally. However, cancer care services  
32 are often concentrated in urban centres. Two of South Africa's hospitals have  
33 decentralised cancer care delivery since February 2018 and August 2019 respectively.  
34 This study aims to describe the demographic, epidemiological and clinical profile of  
35 various cancers at Nelson Mandela Academic hospital (NMAH) and Rob Ferreira  
36 hospital (RFH), in South Africa's Eastern Cape and Mpumalanga provinces  
37 respectively.

### 38 **Methods and analysis**

39 This study will be conducted in the Eastern Cape and Mpumalanga provinces. A  
40 mixed methods study design will be undertaken to gain insight on the characteristics  
41 of randomly sampled patients that are treated for cancer at NMAH and RFH between  
42 the 01<sup>st</sup> of March 2018 and the 28<sup>th</sup> of February 2022. A validated, researcher-  
43 administered survey questionnaire will be used to assess demographic characteristics,  
44 and prevalence of different cancers among patients. Concurrently, a document  
45 review will be undertaken on cancer patients using a patient registry to ascertain the  
46 duration of diagnosis, type of cancer(s), management plan and patient survival time.  
47 STATA version 16 will be used for data analysis. The Shapiro-Wilk test will be used to  
48 explore the distribution of numerical variables. The Chi-squared or Fisher's exact tests  
49 will be used depending on the value of the expected frequencies to compare  
50 categorical variables. Kaplan-Meier survival estimates will be used to determine the  
51 survival time. Hazard ratios will be used to determine the predictors of death. The level  
52 of statistical significance will be set at p-value  $\leq 0.05$ . The 95% confidence interval will  
53 be used for the precision of estimates.

### 54 **Ethics and dissemination**

55 Ethics approval was obtained from the Human Research Ethics Committees of the  
56 University of the Witwatersrand (M210211) and Walter Sisulu University, South Africa  
57 (Ref: 040/2020). Findings will be reported through peer-reviewed journal(s),  
58 presentations at conferences and at partner meetings.

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4 60 **Keywords:** Cancer, decentralised, referral, oncology; AND South Africa  
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3 61 **Strengths and limitations of this study**  
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- 5 62 ➤ To our knowledge this is the first study to formally report on decentralisation of  
6 cancer care services in South Africa.  
7 63  
8 64 ➤ Triangulation of designs compensates for the potential limitations of a single  
9 design and thus provide more insight on cancer care delivery models in the  
10 65 selected study sites.  
11  
12 66  
13 67 ➤ The ambi-directional cohort design does not only enable the assessment of the  
14 survival time and predictors of death but also enables the retrospective and  
15 68 prospective follow-up of patients and thus understand their care plans better.  
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17 69  
18 70 ➤ The study could be limited by the quality of data or poor information systems  
19 thus resulting in missing data.  
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## 72 INTRODUCTION

73 Cancer is considered to be the number two cause of death globally, accounting for  
74 an estimated 9.6 million deaths.<sup>1 2</sup> Africa has the second lowest rate of cancer related  
75 deaths contributing 7.1% to the total cancer deaths globally.<sup>3</sup> Cancer is expected to  
76 continue to rise as part of the epidemiological transition globally, further straining  
77 limited healthcare resources.<sup>1</sup> Signs of this prediction have become more visible with  
78 rapidly growing global cancer incidence and mortality rates.<sup>4</sup>

79 Approximately a third of cancer deaths are due to behavioural and dietary risks, such  
80 as, high body mass index, low fruit and vegetable intake, lack of physical activity,  
81 tobacco use, and alcohol use.<sup>6</sup> For example, smoking is the most common  
82 preventable cause of premature mortality worldwide but it contributes to almost 30%  
83 of all cancers in high income countries (HICs).<sup>7</sup> These risk factors are preventable<sup>5</sup> and  
84 may be substantially reduced through adjustments in lifestyle.<sup>2</sup>

85 In South Africa cancer is a growing national health and socio-economic concern.<sup>5</sup>  
86 According to the International Agency for Research on Cancer (IACR) in 2020 there  
87 were 108 168 new cancer cases in South Africa, bringing the risk of developing cancer  
88 before the age of 75 years to 20.7% (23.6 % male and 18.7% female).<sup>9</sup> In the same  
89 year, 56 802 deaths were reported, bringing the risk of dying from cancer before the  
90 age of 75 years to 11.8% (13.9% male and 10.4% among female).<sup>9</sup> The increasing  
91 incidence and mortality rates present a huge challenge to the affected patients and  
92 their families especially those who have limited access to care.<sup>5</sup>

93 In 2016, the top five cancers affecting women in South Africa were, breast cancer  
94 (27.1%), cervical cancer (18.7%); colorectal cancer (6.3%); lung cancer (4.9%) and  
95 cancer of the uterus (3.9%), while the top five cancers affecting men were, prostate  
96 cancer (25.8%); lung cancer (12%); colorectal cancer (7.3%); Kaposi sarcoma (4.9%)  
97 and non-Hodgkin's lymphoma (4.1%).<sup>4</sup> The Nelson Mandela Academic Hospital  
98 (NMAH), Eastern Cape province and Rob Ferreira Hospital (RFH), Mpumalanga  
99 province embarked on a decentralised model of cancer care delivery in February  
100 2018 and August 2019 respectively. Decentralisation refers to making cancer services  
101 available in certain hospitals that previously did not have any cancer care service  
102 provision, such as our two study sites. In this way, patients can access quality cancer  
103 services closest to where they live, health professionals will be able to screen and  
104 diagnose early, unnecessary delays to treatment will be reduced and patients will get

1  
2  
3 105 quality palliative care closer to their families. A positive effect of this proposition is that  
4 106 patients' and families' healthcare-related out of pocket costs will be reduced.

7 107 The two hospitals aim to establish centres of excellence in cancer care, a network of  
8  
9 108 cancer care satellite sites at district hospital level and community-based cancer care  
10  
11 109 services. Decentralisation is meant to be achieved in four different phases. The first  
12  
13 110 phase entailed decentralisation of chemotherapy services from Frere hospital (East  
14  
15 111 London) and Inkosi Albert Luthuli hospital (Durban, KwaZulu-Natal province) to NMAH  
16  
17 112 in February 2018 for patients from the OR Tambo district (the district where NMAH is  
18  
19 113 located), and three other neighbouring districts for patients in the Eastern Cape  
20  
21 114 province. For Mpumalanga province, all chemotherapy services were decentralised  
22  
23 115 to RFH from Steve Biko and Kalafong hospitals in the Gauteng province in August 2019.  
24  
25 116 The two hospitals (NMAH and RFH) were assisted with the hiring of radiation and  
26  
27 117 medical oncologists, oncology trained professional nurses, pharmacists, social  
28  
29 118 workers, clinical psychologists, ultrasound and mammogram technicians, and  
30  
31 119 administrators. Equipment includes a spirometer, mammogram, ultrasound,  
32  
33 120 colposcopy, and a large loop excision of the transformation zone (LLETZ) machines in  
34  
35 121 both hospitals.

33 122 The second phase (current phase) entails decentralisation of chemotherapy services  
34  
35 123 further from NMAH to four Regional hospitals and one District hospital in the Eastern  
36  
37 124 Cape. However, only one of the five hospitals has been fully decentralised from  
38  
39 125 February 2021, the other four hospitals have achieved partial decentralisation with the  
40  
41 126 procurement of equipment. For Mpumalanga, the second phase entails  
42  
43 127 decentralisation of chemotherapy services from RFH to Witbank hospital for patients  
44  
45 128 from two of their three districts from May 2021.

46 129 The third phase will be full decentralisation of radiotherapy services from Frere hospital  
47  
48 130 to NMAH in the Eastern Cape and from Steve Biko and Kalafong hospitals to RFH, then  
49  
50 131 Witbank hospital in Mpumalanga. The fourth and final phase is the strengthening of  
51  
52 132 district hospitals and community-based services to manage aspects of cancer  
53  
54 133 effectively from screening, diagnosis, treatment, and palliative care support. This  
55  
56 134 phase will also increase the pool of oncology trained nurses and medical officers at  
57  
58 135 primary care and district hospital level. These latter two phases are still outstanding.

58 136 Evidently, the current decentralised model of care is only limited to patients requiring  
59  
60 137 chemotherapy. It is hoped that the continued implementation of the decentralised

1  
2  
3 138 model of cancer care will improve patient experience and quality of cancer care  
4  
5 139 and reduce morbidity and mortality. However, data on patient demographic  
6  
7 140 characteristics, epidemiological and clinical profile of various cancers is lacking in  
8  
9 141 these two hospitals. This study therefore seeks to conduct an assessment of  
10  
11 142 demographic, epidemiological and clinical profile of various cancers in NMAH and  
12  
13 143 RFH. Furthermore, the study aims to describe the current process and its  
14  
15 144 benefits/challenges, with hopes of expanding 'decentralisation of care' in terms of  
16  
17 145 services offered and number of decentralised hospitals.

146

### 147 **Significance**

148 South Africa's cancer services are generally urban-based and located in tertiary and  
149  
150 quaternary health centres with an underdeveloped cancer service platform at district  
151  
152 hospital and primary care levels. This means that patients needing cancer care have  
153  
154 to travel long distances to big cities/towns in order to access basic cancer care. This  
155  
156 creates gaps in access and quality of cancer care delivery between urban areas and  
157  
158 rural areas. Decentralisation is a result of operational observations (to our knowledge  
159  
160 there is no formal research that was done) such as long waiting times, delayed  
161  
162 presentations, late diagnosis, patient complaints on travelling and out of pocket costs,  
163  
164 etc. It is therefore envisaged that this study will provide insight on the distribution and  
165  
166 types of cancers in areas where there is currently an underestimation of the burden  
167  
168 of disease and as a result incorrect understanding of the levels of risk within the local  
169  
170 populations. Moreover, establish the extent of the problem in both health facilities and  
171  
172 possibly justify the need for decentralisation of cancer care services and help inform  
173  
174 cancer preventive strategies in South Africa and other similar settings.

### 162 **Objectives**

- 163 - To describe the socio-demographic characteristics of patients diagnosed with  
164  
165 cancer in the selected hospitals in the Eastern Cape and Mpumalanga provinces,  
166  
167 South Africa.  
168  
169 - To determine and compare the incidence rate and prevalence of different types  
170  
171 of cancer in the selected hospitals.

- 1  
2  
3 168 - To determine and compare the geographic distribution of cancers in the Eastern  
4 Cape and Mpumalanga provinces of South Africa.  
5 169  
6  
7 170 - To determine the gaps between symptom development, first presentation at a  
8 171 health institution, first cancer diagnosis, referral for definitive management and  
9 172 initiation on treatment of patients diagnosed with cancer in South Africa's Eastern  
10 173 Cape and Mpumalanga provinces.  
11  
12  
13 174 - To determine the comorbid conditions of patients with a cancer diagnosis in South  
14 Africa's Eastern Cape and Mpumalanga provinces.  
15 175  
16  
17 176 - To determine the survival time of patients diagnosed with cancer in South Africa's  
18 177 Eastern Cape and Mpumalanga provinces.  
19  
20  
21 178

## 179 **METHODS AND ANALYSIS**

### 180 **Research design**

181 This study will utilise a quantitative approach with a triangulation of a descriptive,  
182 exploratory cross-sectional and a longitudinal cohort design to answer the study  
183 objectives. The triangulation of designs compensates for the potential limitations of a  
184 single design. This study forms part of a bigger but yet to be published research project  
185 titled: "Exploring the feasibility, implications and outcomes of decentralising cancer  
186 care delivery in the Eastern Cape and Mpumalanga provinces of South Africa".

187 Information will be sourced through two quantitative sub-studies, a cross-sectional  
188 survey with cancer patients and an ambi-directional cohort document review. Below  
189 is a brief description of the two sub-studies.

#### 190 Sub-study 1: Quantitative cross-sectional study

191 A quantitative survey questionnaire will be administered on patients to assess  
192 demographic characteristics, prevalence of different cancers in selected hospitals  
193 and compare geographic distribution of cancers in the Eastern Cape and  
194 Mpumalanga provinces.

#### 195 Sub-study 2: Quantitative ambi-directional cohort study design

196 Using the cancer patient registry used in the study sites, a document review will be  
197 carried out on cancer patients to ascertain the duration of cancer diagnosis, type of

198 cancer(s), and the duration of survival since admission to the oncology clinic (survival  
199 time). Figure 1 shows the ambi-directional component of the study. Table 1  
200 summarises the two sub-studies.

201

202 **Table 1:** Research methods summary

Sub-study	Study design	Objectives	Analysis
1	Cross-sectional study	<ul style="list-style-type: none"> <li>- Describe socio-demographic characteristics of patients.</li> <li>- Determine and compare the geographic distribution of cancers.</li> <li>- Determine cancer disease progression.</li> <li>- Determine comorbid conditions of cancer patients.</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency tables, percentages, and graphs to summarise categorical variables.</li> <li>• Mean, standard deviation and range to summarise normally distributed numerical variables; or Median and interquartile range to summarise skewed numerical variables.</li> </ul>
2	Ambi-directional cohort study (document review)	<ul style="list-style-type: none"> <li>- Determine and compare the incidence rate and prevalence of different types of cancer in the selected hospitals.</li> <li>- Determine the comorbid conditions of patients with a cancer diagnosis.</li> <li>- Determine the survival time of patients diagnosed with cancer.</li> </ul>	<ul style="list-style-type: none"> <li>• Chi-squared statistics or Fisher's exact test to compare categorical variables between groups.</li> <li>• Parametric and/or non-parametric tests to compare numerical variables between groups.</li> <li>• Kaplan-Meier survival estimates, for survival time.</li> <li>• Hazard ratios for predictors of death.</li> </ul>

203

204 **Study setting**

205 The study is located in two rural provinces with a high degree of under-development  
206 and marginalisation, namely Eastern Cape and Mpumalanga provinces in South  
207 Africa.<sup>10</sup> Generally, Eastern Cape and Mpumalanga provinces are characterised by

1  
2  
3 208 lack of the necessary infrastructure, resources, and expertise to provide quality, safe  
4  
5 209 and accessible radiotherapy, chemotherapy, palliative care services and surgical  
6  
7 210 oncology services. Patients from rural communities, who generally cannot afford  
8  
9 211 private healthcare and are dependent on state health services for cancer care, are  
10  
11 212 compelled to travel long distances to the urban-based tertiary or quaternary cancer  
12  
13 213 care centres in order to access cancer care. The study will be conducted in two  
14  
15 214 hospitals, NMAH in Mthatha, Eastern Cape province and RFH in Mbombela,  
16  
17 215 Mpumalanga province. NMAH is one of ten central hospitals in South Africa and is the  
18  
19 216 only one that is located in a rural area. This level of care is meant to be a quaternary  
20  
21 217 level of care. RFH is a tertiary level of care hospital.

21  
22 218 These are two hospitals in their respective provinces that refer their patients to seek  
23  
24 219 quality cancer care in hospitals which are further away. At times, it takes patients up  
25  
26 220 to 3-days of traveling when attending to their cancer care appointments. For  
27  
28 221 example, cancer patients from Mpumalanga's RFH travel more than 400 kilometres to  
29  
30 222 the country's capital city, Pretoria. While cancer patients from the Eastern Cape's  
31  
32 223 NMAH travel more than 200 kilometres to East London to access quality cancer care  
33  
34 224 at an urban-based tertiary hospital. An anomaly, as NMAH is statutorily a level of care  
35  
36 225 higher than a tertiary hospital.

37  
38 226

### 38 227 **Population and Sampling**

39  
40 228 Purposive sampling was used to select the study hospitals. The hospitals were selected  
41  
42 229 based on their levels of care, gazetted specialist packages of care and concerns  
43  
44 230 about the existing package of cancer care services, and because they are currently  
45  
46 231 implementing a decentralised model of cancer care delivery. Furthermore, the two  
47  
48 232 hospitals aim to establish centres of excellence in cancer care, a network of cancer  
49  
50 233 care satellite sites at district hospital level and community-based cancer care  
51  
52 234 services.

53  
54 235 A triangulation of approaches will be used to select study participants from the two  
55  
56 236 hospitals.

57  
58 237 Sub-study 1: Quantitative cross-sectional study (patients)



1  
2  
3 238 Systematic random sampling of patients visiting the oncology clinics' outpatient's  
4 239 department will be conducted by approaching every 5<sup>th</sup> patient on the queue until  
5 240 the sampling size has been reached. A total combined sample size for the two  
6  
7 241 hospitals will be calculated using the equation,  $n = \frac{p(1-p)z^2}{d^2}$  for a one-sided 95%  
8  
9 242 confidence interval and a 5% significance level ( $z=1.96$ ). Because the proportion ( $p$ )  
10 243 of cancer patients who are seen in the respective hospitals is not known, this ( $p$ ) will  
11 244 be set at 50% and the margin of error ( $d$ ) will be set at 5%. This thus yields a total  
12 245 minimum sample size of 385. To factor for data entry errors a further 10% (39) will be  
13 246 added to yield a desired sample size of 424 participants for the two sites. Participants  
14 247 will then be recruited proportionally to yield a sample size of 212 patients per site.

21 248 Sub-study 2: Quantitative ambi-directional cohort (document review)

23 249 Information will be extracted from the patient registry to respond to the questions on  
24 250 the extraction tool. All patients under the care of the unit at any stage between the  
25 251 01<sup>st</sup> of March 2018 and the 28<sup>th</sup> of February 2022 will be included.

28  
29 252

### 31 253 **Data collection**

33 254 A multi-method approach to data collection will be adopted to get a  
34 255 comprehensive picture on cancer in the selected hospitals in terms of demographic  
35 256 distribution of cancer, socio-economic characteristics, prevalence, duration of  
36 257 diagnosis, etc. This approach will also compensate for the potential limitations of a  
37 258 single data collection method and to triangulate the data as a means of checking  
38 259 the consistency of the study findings.

44 260 Sub-study 1: Quantitative cross-sectional study (patients)

46 261 The aim of this survey is to assess socioeconomic demographic characteristics of  
47 262 cancer patients, prevalence of different cancers in selected hospitals, and compare  
48 263 geographic distribution of the different cancers from the end-user's perspective. This  
49 264 sub-study will adopt and utilise a standardised and validated quantitative survey tool  
50 265 (Appendix A) to collect data from patients. The survey tool for patients has 51  
51 266 questions developed through literature review and whose content validity was  
52 267 reviewed by three experts (one Occupational medicine specialist, a Public Health  
53 268 Medicine specialist, and an Oncologist). The questionnaire asks about the patient  
54 269 demographic profile and Epidemiological and clinical profile of various cancers. To

1  
2  
3 270 test and ensure the effectiveness, the survey tool was also piloted amongst six  
4  
5 271 patients in the two hospitals. Once the pilot study was done, all necessary  
6  
7 272 adjustments were made to the data collection tool, thus ensuring that all questions  
8  
9 273 will enhance the validity and reliability of the study findings. On clarity, there was  
10  
11 274 100% agreement among all three experts. On relevance only one of the three experts  
12  
13 275 scored one question as irrelevant to result in an average score Content Validity Index  
14  
15 276 of 0.99 (99%), which still renders the tool valid. Appendix B shows the experts' scoring  
16  
17 277 in detail. This questionnaire has been translated into the local languages (isiXhosa,  
18  
19 278 siSwati, and isiZulu) to accommodate participants who might not be comfortable  
20  
21 279 with English.

22  
23 280 Sub-study 2: Quantitative ambi-directional cohort study (document review)

24  
25 281 Using a data extraction tool (Appendix C), a document review will be conducted in  
26  
27 282 addition to the survey questionnaire. The main aim of the document review is to  
28  
29 283 ascertain information which could not be captured or verified from the survey  
30  
31 284 questionnaire, including, duration of cancer diagnosis, types of cancer, and survival  
32  
33 285 time of cancer patients from the date of diagnosis.

### 34 287 **Data management and analysis**

35  
36 288 Quantitative data analysis will include capturing survey data into Microsoft Excel  
37  
38 289 Office 2016 and exporting the data into STATA version 17 (STATA Corp, College Station,  
39  
40 290 Texas, USA) for analysis. Some descriptive and categorical data will be compared  
41  
42 291 using frequencies, percentages, and graphs. Numerical data will be explored for  
43  
44 292 normality using the Shapiro-Wilk test.<sup>11</sup> If normally distributed the mean, range and  
45  
46 293 standard deviation will be used. If not normally distributed, then the median, and  
47  
48 294 interquartile range (IQR) will be used. The Wilcoxon rank sum or an appropriate two-  
49  
50 295 sample t-test will be used to compare the mean or median age of cancer patients by  
51  
52 296 cancer type and between the two sites depending on the normality of the distribution  
53  
54 297 of age and/or the equality of variances. A test for the equality of variances will be  
55  
56 298 performed before use of the two-sample t-tests, if numerical variables are normally  
57  
58 299 distributed. The two-sample t-test for independent samples will be carried out if  
59  
60 300 variances are equal, and Satterthwaite's modified t-test used if the variances are not  
301  
302 equal. The Chi-squared or Fisher's exact tests will be used depending on the value of  
the expected frequencies. If expected frequencies are <5 in binary comparisons or if

any one cell of a larger comparison has an expected frequency of  $<1$  or more than 20% of the cells of nominal categorical comparisons have an expected frequency of  $<5$  then the Fisher's exact test will be used. Kaplan-Meier survival estimates will be used to determine the survival time. Hazard ratios will be used to determine the predictors of death. The level of statistical significance will be set at  $p\text{-value} \leq 0.05$ . The 95% confidence interval will be used for the precision of estimates. Through triangulation, the analysis of the survey will seek to reproduce the cancer prevalence, epidemiological profiles and demographic characteristics determined in sub-study 1. These should be similar as determined by statistical methods (95% confidence interval and two-sample test of proportions).

### 313 **Limitations**

314 The study could be limited by the quality of data or poor information systems thus  
315 resulting in missing data. The assessment of the data at three time points will allow for  
316 the reduction of missing data as we will note suspicious entries and/or missing data  
317 and request for assistance with correction/filling of the missing data using the patient  
318 records or confirming from patients and/or family members. Missing data will be  
319 analysed using complete case analysis. The main outcome (cancer related deaths)  
320 could be limited by the absence of a mechanism linking to the death certificate,  
321 and/or autopsy. Every unspecified natural cause of death will therefore be  
322 considered to be related to the cancer as a direct or associated cause of death.

### 324 **Patient and public involvement**

325 The planning of the cancer service expansion involved community representatives  
326 through hospital boards in workshops and meetings. Patients will be informed of the  
327 study at all stages through consultations and public notices in the study sites.

### 329 **Ethics and dissemination**

330 Ethics approval was obtained from the Human Research Ethics Committees of the  
331 University of the Witwatersrand (M210211) and Walter Sisulu University, South Africa  
332 (040/2020). Site access approval has been obtained from the Provincial Health  
333 Research Committees of the Eastern Cape (EC\_202010\_012) and Mpumalanga  
334 (MP\_202011\_002) provinces respectively. The study will abide by the 4 ethical

1  
2  
3 335 principles of autonomy, beneficence, non-maleficence, and justice. Participants will  
4  
5 336 be informed that their participation in this study is voluntary and that their  
6  
7 337 confidentiality will be maintained throughout the study. Participants will also be  
8  
9 338 assured that they are free to withdraw at any stage of the study and could opt-out of  
10  
11 339 questions that they are not comfortable with. All identifying information will be  
12  
13 340 removed. All electronic records will be accessed through a password encrypted  
14  
15 341 database that only the principal investigator has access to. No direct incentives will  
16  
17 342 be issued to participants. Before initiating the self-administered questionnaires,  
18  
19 343 informed consent forms will be signed by all study participants. A waiver of consent  
20  
21 344 has been attained for the document review. Information sheets and consent forms  
22  
23 345 will be translated into relevant local languages (isiXhosa, Siswati and isiZulu). They will  
24  
25 346 also be assured that data collected will be used only for the purposes of the study.

26  
27 347 Findings of the study will be disseminated widely to all stakeholders, including  
28  
29 348 participants; and will be used to inform both provincial and national strategies to  
30  
31 349 expand and sustain provision of high-quality cancer screening, diagnosis, treatment,  
32  
33 350 and palliative services, and promote community-based cancer care programmes.  
34  
35 351 Results will be presented at annual partner meetings, national and international  
36  
37 352 conferences. Results will also be published in open access peer-reviewed journals to  
38  
39 353 facilitate broad access to findings.

36  
37 354

### 38 355 **Authors' contributions**

40  
41 356 WC conceived the research, sourced funding, engaged stakeholders, completed the  
42  
43 357 first draft of the manuscript and jointly approved final draft. ORM edited and  
44  
45 358 commented on versions of the manuscript and incorporated and addressed  
46  
47 359 feedback from the co-authors. SAM edited versions of the manuscript, provided  
48  
49 360 methodological strategy, validated the quantitative survey tool, and jointly approved  
50  
51 361 final draft. ZJ is the content expert, edited and commented on versions of the  
52  
53 362 manuscript. BS facilitated ethics and research access approvals, edited version of the  
54  
55 363 manuscript. VE validated the quantitative survey tool and edited versions of the  
56  
57 364 manuscript. DH, LG, NW, CZ, LB, SK, JN, SS, OG and AM edited versions of the  
58  
59 365 manuscript.

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1  
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4

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6  
7

8 369  
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10 370 **Competing interests**  
11

12 371 None declared  
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For peer review only

373 **REFERENCES**

- 374 1. Fitzmaurice C, Abate D, Abbasi N, et al. Global, Regional, and National Cancer  
 375 Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-  
 376 Adjusted Life-Years for 29 Cancer Groups, 1990 to 2017: A Systematic Analysis for  
 377 the Global Burden of Disease Study. *JAMA Oncol* 2019;5(12):1749-68. doi:  
 378 10.1001/jamaoncol.2019.2996 [published Online First: 2019/09/29]
- 379 2. World Health Organisation. Cancer factsheet Geneva: WHO; 2020 [cited 2021 01  
 380 June]. Available from: <https://www.who.int/news-room/fact-sheets/detail/cancer>  
 381 accessed 01 June 2021.
- 382 3. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN  
 383 estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA*  
 384 *Cancer J Clin* 2018;68(6):394-424. doi: 10.3322/caac.21492 [published Online First:  
 385 2018/09/13]
- 386 4. Ferlay J, Colombet M, Soerjomataram I, et al. Estimating the global cancer  
 387 incidence and mortality in 2018: GLOBOCAN sources and methods. *Int J Cancer*  
 388 2019;144(8):1941-53. doi: 10.1002/ijc.31937 [published Online First: 2018/10/24]
- 389 5. South African National Department of Health. The National Cancer Strategic  
 390 Framework 2017 – 2022. Pretoria: NDOH, 2017.
- 391 6. Ott JJ, Ullrich A, Mascarenhas M, et al. Global cancer incidence and mortality  
 392 caused by behavior and infection. *J Public Health (Oxf)* 2011;33(2):223-33. doi:  
 393 10.1093/pubmed/fdq076 [published Online First: 2010/10/12]
- 394 7. Jha P. The hazards of smoking and the benefits of cessation: a critical summation  
 395 of the epidemiological evidence in high-income countries. *Elife* 2020;9 doi:  
 396 10.7554/eLife.49979 [published Online First: 2020/03/25]
- 397 8. Seitz HK, Becker P. Alcohol metabolism and cancer risk. *Alcohol Res Health*  
 398 2007;30(1):38-41, 44-7. [published Online First: 2007/08/28]
- 399 9. International Agency for Cancer Research. Globocan South Africa Geneva: WHO;  
 400 2020 [cited 2021 01 June ]. Available from:  
 401 [https://gco.iarc.fr/today/data/factsheets/populations/710-south-africa-fact-](https://gco.iarc.fr/today/data/factsheets/populations/710-south-africa-fact-sheets.pdf)  
 402 [sheets.pdf](https://gco.iarc.fr/today/data/factsheets/populations/710-south-africa-fact-sheets.pdf) accessed 01 June 2021.
- 403 10. Statistics South Africa. Statistics by Place: Census 2011 Pretoria, South Africa:  
 404 Statistics South Africa; 2020 [Available from:  
 405 [http://www.statssa.gov.za/?page\\_id=964](http://www.statssa.gov.za/?page_id=964) accessed 08 June 2021.
- 406 11. Vetter TR. Fundamentals of Research Data and Variables: The Devil Is in the Details.  
 407 *Anesth Analg* 2017;125(4):1375-80. doi: 10.1213/ane.0000000000002370 [published  
 408 Online First: 2017/08/09]

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4

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6  
7 413 officials of the participating hospitals and provinces for their assistance.  
8

9 414 **Patient consent for publication**  
10

11  
12 415 Not required as this is a protocol. Patients to give consent before enrolment into the  
13  
14 416 study.  
15

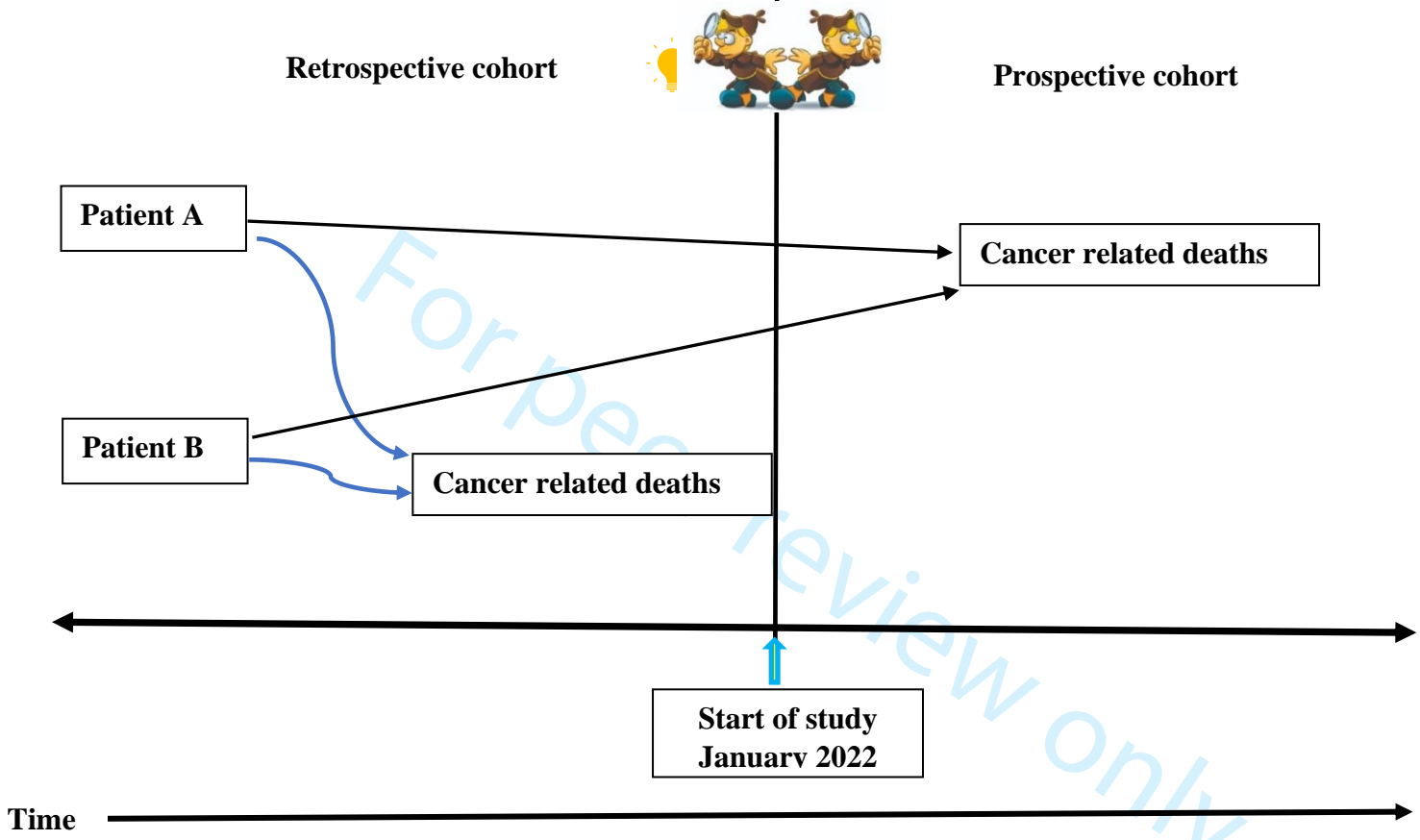
16 417

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18 418 **Figure 1: Summary of ambi-directional cohort sub-study**  
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20 419

21  
22 420 **Figure 1:** Ambi-directional cohort study for sub-study 2.  
23

24 421 **Note.** Data collection will commence in January 2022 till the end of September 2022. Record  
25 422 review of patients diagnosed with cancer from 1 March 2018 will be done. Patients will be  
26 423 followed up for survival time either retrospectively (cancer related deaths between 1 March  
27 424 2018 to January 2022), or prospectively (cancer related deaths from January 2022 until the  
28 425 study's end date, 30 September 2022).  
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**Figure 1:** Ambi-directional cohort study for sub-study 2.

**Note.** Data collection will commence in January 2022 till the end of September 2022. Record review of patients diagnosed with cancer from 1 March 2018 will be done. Patients will be followed up for survival time either retrospectively (cancer related deaths between 1 March 2018 to January 2022), or prospectively (cancer related deaths from January 2022 until the study's end date, 30 September 2022).



**Appendix A**

Survey questionnaire (patients)

**INSTRUCTIONS:** Fill in the blank spaces with a tick where appropriate.**Date of Administration:** \_\_\_\_\_**Section 1: demographic profile**

## 1. Gender

1	Female	
2	Male	

## 2. Date of Birth

Dd/Mm/Yy: 

--	--	--	--	--	--	--	--	--	--

## 3. Ethnicity

1	African	
2	White	
3	Indian	
4	Coloured	
5	Other: specify	

## 4. Marital status

1	Never Married	
2	Married (including lobola)	
3	Divorced/Separated	
4	Widowed	
5	Cohabiting	

5. What is the highest standard/grade or level you have passed at school or tertiary education?

-----

6. Are you currently studying?

1	Yes	
2	No	

7. What is your current level of study? .....

8. Are you employed?

a)

1	Yes	
2	No	

b) If employed, what type of work do you do? .....

9. Source of income (tick all appropriate)

1	2	3	4	5	6	7	8	9
Job	Old Age Grant	Disability Grant	Other Pension	Spousal support	Support from children	Child support grant	None	Other (Specify)

10. What is your gross family income each month (that is, before tax)?

1	No income		7	R6 401 – R12 800	
2	R1 – R400		8	R12 801 – R25 600	
3	R401 – R800		9	R25 601 – R51 200	
4	R801 – R1 600		10	R51 201 – R102 400	
5	R1 601 – R3 200		11	R102 401 – R204 800	
6	R3 201 – R6 400		12	More than R204 800	

11. What is the name of your place of residence? .....

12. Which health facility referred you here (Name)?

.....

1  
2  
3 **Section 2: Epidemiological and clinical profile of various cancers**  
4

5 13a. Do you have a family history of cancer?  
6

7 1	2	3
8 Yes	9 No /	10 Unsure
11		

12  
13  
14 13b. If yes to above, how are you related to the family member(s) who has the cancer diagnosis?  
15  
16 \_\_\_\_\_  
17 \_\_\_\_\_

18 13c. What type of cancer(s) does the family member(s) have?  
19  
20 \_\_\_\_\_  
21 \_\_\_\_\_  
22 \_\_\_\_\_  
23 \_\_\_\_\_

24 14. Do you smoke? (tick all appropriate)  
25

26 a)

27 1	Yes	
28 2	No	

29  
30  
31 b) If Yes, when did you start smoking?  
32

33 Year: \_\_\_\_\_  
34

35 c) On average, how many cigarettes do you smoke in a day? \_\_\_\_\_  
36

37 d) If No, have you ever smoked?  
38  
39

40 1	Yes	
41 2	No	

42  
43  
44 e) For how long did you smoke? \_\_\_\_\_  
45

46 f) How many did you smoke in a day? \_\_\_\_\_  
47  
48

49 1	Once	
50 2	Twice	
51 3	Three time	
52 4	More than 3 times	

g) Did you stop smoking?

1	Yes	
2	No	

h) How long ago did you stop smoking? \_\_\_\_\_

15. Do you drink alcohol?

a)

1	Yes	
2	No	

b) Did you drink alcohol before?

1	Yes	
2	No	

16. Do you exercise (physical) on a regular basis?

1	Yes	
2	No	

17. Have you ever worked in mines?

1	Yes	
2	No	

18. How long in years did you work in mines? .....

19. Which mines (tick all that apply)? .....

1	Gold	
2	Platinum	
3	diamond	
4	Coal	
5	Other (specify)	

20. Please indicate if your family has a history of any cancer/s below?

1	Breast cancer	6	Uterus cancer
2	Lung cancer	7	Colon cancer
3	Cervical cancer	8	Ovarian cancer
4	Prostate Cancer	9	Other (specify)
5	Oesophagus cancer	10	No history of cancer in my family

21. Before you were told you needed to go to hospital about cancer, how many times did you see other doctors or health professionals about the health problem caused by cancer?

		1x	2x	3x	4x	5x	Other
1	I visited my local clinic						
2	I visited my local hospital						
3	I saw my local private doctor						
4	I saw my traditional healer/doctor/ Isangoma						
5	Other (specify):						

22. How do you feel about the length of time you had to wait before your first appointment with a hospital doctor or clinic doctor?

1	I was seen as soon as I thought was necessary
2	I should have been seen a bit sooner

23. How long was it from the time you identified symptoms?

-----

-----

24. Did your symptoms get better or worse or were the same while you were waiting for your first appointment with a hospital doctor?

-----

-----

-----

25. What type of cancer(s) were you diagnosed with?

-----

-----

26. When was your cancer(s) diagnosed?

-----

-----

1  
2  
3 27. What health problems or symptoms did you notice at first?  
4  
5  
6  
7

.....  
.....  
.....

8 28. Who first told you that you had cancer?  
9

1	A hospital doctor	
2	A hospital nurse	
3	A GP (family doctor)	
4	Another health professional (specify)_____	
5	A friend or relative	
6	Nobody – I worked it out for myself	
7	Cannot remember	

25  
26 29. When you were first told that you had cancer, had you been told you could bring a family member or friend with you?  
27

1	Yes	
2	No	
3	It was not necessary	
4	I was told by phone or letter	
5	Don't know / Can't remember	
6	Other (specify)_____	

38  
39  
40 30. How do you feel about the way you were told you had cancer?  
41  
42  
43  
44  
45

.....  
.....  
.....

46 30. Did you understand the explanation of what was found with you?  
47

1	Yes	
2	No	

48  
49  
50 31. When you were told you had cancer, were you given written information about the type of cancer you had?  
51  
52  
53  
54  
55

1	Yes	
2	No	

32. Before your cancer treatment started, were you given a choice of different types of treatment?

1	Yes	
2	No, but I would have liked a choice	
3	I was not given a choice because only one type of treatment was suitable for me	
4	Not sure / Can't remember	
5	Missing	

33. Do you think your views were taken into account when the team of doctors and nurses caring for you were discussing which treatment you should have?

1	Yes	
2	No	

34. Were the possible side effects of treatment(s) explained in a way you could understand?

1	Yes	
2	No	

35. Before you started your treatment, were you given verbal/written information about the side effects of treatment(s)?

1	Yes	
2	No	

36. Were you involved as much as you wanted to be in decisions about your care and treatment?

1	Yes	
2	No	

37a. During the last 12 months, have you had an operation (such as removal of a tumour or lump) at one of the hospitals named in the covering letter?

1	Yes	
2	No	
3	Not sure	

1  
2  
3 b. Before you had your operation, did a member of staff explain what would be done during the operation?  
4

5 6 7 8 9	1	Yes	
	2	No	

10 38. The last time you went into hospital for a cancer operation, was your admission date changed to a later date by the  
11 hospital?  
12

13 14 15 16 17 18 19	1	Yes	
	2	No	

20 39. Beforehand, were you given written/verbal information about your operation?  
21

22 23 24 25 26	1	Yes	
	2	No	

27 40. After the operation, did a member of staff explain how it had gone in a way you could understand?  
28

29 30 31 32 33	1	Yes	
	2	No	

34 41. As far as you know, was the hospital or your doctor that referred you for cancer treatment given enough information  
35 about your condition and the treatment you had at the hospital?  
36

37 38 39 40 41 42 43	1	Yes	
	2	No	
	3	Don't know / Can't remember	

44 42. Do you think the doctors and nurses at your local hospital or clinic did everything they could to support you while you  
45 were in their care?  
46

47 48 49 50 51 52 53 54 55 56 57 58 59 60	1	Yes	
	2	No	



**Appendix B**

Document review template

##	Date of birth	Province	Site	Child	Patient Classification	Referred patient	Referral Type	Internal Referral Department	Referring Hospital_Mpumalanga	-
1.										
2.										
3.										
4.										
5.										

##	Referring Hospital_EC	Referral Hospital	Gender	Race	Citizenship	Medical Aid	Postal code	Employed	Source of income	Specify Occupation	-
6.											
7.											
8.											
9.											
10.											

##	Previous work in mine	Number of Years worked in mines	Marital Status	Date of 1st oncology visit	Date of diagnosis	Cancer diagnosis 1	ICD10_Cancer diagnosis1	Cancer diagnosis1 - Stage	Cancer diagnosis 2	ICD10_Cancer diagnosis2	-
11.											
12.											
13.											
14.											
15.											

##	Cancer diagnosis2_Stage	Cancer diagnosis3	ICD10_Cancer diagnosis3	Cancer diagnosis3_Stage	Chemotherapy	Onco_Drug1	Onco_Drug2	Neupogen	Hormonal Therapy	Blood Transfusion	-
16.											
17.											
18.											
19.											
20.											

##	Radiotherapy	PET_Bone Scan	Palliative Care	Social support	Psychological support	HIV	Hypertension	Diabetes Mellitus	COPD	Asthma	-
21.											
22.											
23.											
24.											
25.											

##	Other Chronic Disease1_Name	Other Chronic Disease2_Name	Family history of cancer	Previous Smoker	Current Smoker	Number of years of smoking	Number of cigarettes smoked in a day	Weight in Kg	Height in Centimetres	Date_of_Current_Visit1	-
26.											
27.											
28.											
29.											
30.											

##	Follow-up Date1	RIP Date	Date_of_Current_Visit2	Follow-up Date2	---
31.					
32.					
33.					
34.					
35.					

# BMJ Open

## A protocol of mixed-methods assessment of demographic, epidemiological, and clinical profile of decentralised cancer patients at Nelson Mandela Academic Hospital and Rob Ferreira Hospital, South Africa

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<b>Primary Subject Heading</b>:	Oncology
Secondary Subject Heading:	Health services research, Oncology
Keywords:	ONCOLOGY, Cancer pain < ONCOLOGY, CHEMOTHERAPY, Radiation

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	oncology < RADIOLOGY & IMAGING

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1 **A protocol of mixed-methods assessment of demographic, epidemiological, and**  
2 **clinical profile of decentralised cancer patients at Nelson Mandela Academic Hospital**  
3 **and Rob Ferreira Hospital, South Africa**

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## 28 **ABSTRACT**

### 29 **Introduction**

30 Cancer is the second leading cause of death globally. However, cancer care services are often  
31 concentrated in urban centres. Two of South Africa's hospitals have decentralised cancer care  
32 delivery since February 2018 and August 2019 respectively. This study aims to describe the  
33 demographic, epidemiological and clinical profile of various cancers at Nelson Mandela  
34 Academic hospital (NMAH) and Rob Ferreira hospital (RFH), in South Africa's Eastern Cape  
35 and Mpumalanga provinces respectively.

### 36 **Methods and analysis**

37 This study will be conducted in the Eastern Cape and Mpumalanga provinces. A mixed  
38 methods study design will be undertaken to gain insight on the characteristics of randomly  
39 sampled patients that are treated for cancer at NMAH and RFH between the 01<sup>st</sup> of March  
40 2018 and the 28<sup>th</sup> of February 2022. A validated, researcher-administered survey  
41 questionnaire will be used to assess demographic characteristics, and prevalence of different  
42 cancers among patients. Concurrently, a document review will be undertaken on cancer  
43 patients using a patient registry to ascertain the duration of diagnosis, type of cancer(s),  
44 management plan and patient survival time. STATA version 16 will be used for data analysis.  
45 The Shapiro-Wilk test will be used to explore the distribution of numerical variables. The Chi-  
46 squared or Fisher's exact tests will be used depending on the value of the expected  
47 frequencies to compare categorical variables. Kaplan-Meier survival estimates will be used to  
48 determine the survival time. Hazard ratios will be used to determine the predictors of death.  
49 The level of statistical significance will be set at p-value  $\leq 0.05$ . The 95% confidence interval  
50 will be used for the precision of estimates.

### 51 **Ethics and dissemination**

52 Ethics approval was obtained from the Human Research Ethics Committees of the University  
53 of the Witwatersrand (M210211) and Walter Sisulu University, South Africa (Ref: 040/2020).  
54 Findings will be reported through peer-reviewed journal(s), presentations at conferences and  
55 at partner meetings.

57 **Keywords:** Cancer, decentralised, referral, oncology; AND South Africa

1  
2  
3 58 **Strengths and limitations of this study**  
4

- 5 59 ➤ To our knowledge this is the first study to formally report on decentralisation of cancer  
6 care services in South Africa.  
7 60  
8 61 ➤ Triangulation of designs compensates for the potential limitations of a single design  
9 and thus provide more insight on cancer care delivery models in the selected study  
10 62 sites.  
11 63  
12 64 ➤ The ambi-directional cohort design does not only enable the assessment of the survival  
13 time and predictors of death but also enables the retrospective and prospective follow-  
14 65 up of patients and thus understand their care plans better.  
15 66  
16 67 ➤ The study could be limited by the quality of data or poor information systems thus  
17 68 resulting in missing data.  
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## 69 INTRODUCTION

70 Cancer is considered to be the number two cause of death globally, accounting for an  
71 estimated 9.6 million deaths (1)(2). Africa has the second lowest rate of cancer related deaths  
72 contributing 7.1% to the total cancer deaths globally (3). Cancer is expected to continue to  
73 rise as part of the epidemiological transition globally, further straining limited healthcare  
74 resources (1). Signs of this prediction have become more visible with rapidly growing global  
75 cancer incidence and mortality rates (3).

76 Approximately a third of cancer deaths are due to behavioural and dietary risks, such as, high  
77 body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, and  
78 alcohol use (4). For example, smoking is the most common preventable cause of premature  
79 mortality worldwide but it contributes to almost 30% of all cancers in high income countries  
80 (HICs) (5). These risk factors are preventable (6) and may be substantially reduced through  
81 adjustments in lifestyle (2).

82 In South Africa cancer is a growing national health and socio-economic concern (6). According  
83 to the International Agency for Research on Cancer (IACR) in 2020 there were 108 168 new  
84 cancer cases in South Africa, bringing the risk of developing cancer before the age of 75 years  
85 to 20.7% (23.6 % male and 18.7% female) (7). In the same year, 56 802 deaths were reported,  
86 bringing the risk of dying from cancer before the age of 75 years to 11.8% (13.9% male and  
87 10.4% among female) (7). The increasing incidence and mortality rates present a huge  
88 challenge to the affected patients and their families especially those who have limited access  
89 to care (6).

90 In 2016, the top five cancers affecting women in South Africa were, breast cancer (27.1%),  
91 cervical cancer (18.7%); colorectal cancer (6.3%); lung cancer (4.9%) and cancer of the uterus  
92 (3.9%), while the top five cancers affecting men were, prostate cancer (25.8%); lung cancer  
93 (12%); colorectal cancer (7.3%); Kaposi sarcoma (4.9%) and non-Hodgkin's lymphoma (4.1%)  
94 (3). The Nelson Mandela Academic Hospital (NMAH), Eastern Cape province and Rob  
95 Ferreira Hospital (RFH), Mpumalanga province embarked on a decentralised model of cancer  
96 care delivery in February 2018 and August 2019 respectively. Decentralisation refers to  
97 making cancer services available in certain hospitals that previously did not have any cancer  
98 care service provision, such as our two study sites. In this way, patients can access quality  
99 cancer services closest to where they live, health professionals will be able to screen and  
100 diagnose early, unnecessary delays to treatment will be reduced and patients will get quality  
101 palliative care closer to their families. A positive effect of this proposition is that patients' and  
102 families' healthcare-related out of pocket costs will be reduced.



1  
2  
3 103 The two hospitals aim to establish centres of excellence in cancer care, a network of cancer  
4 104 care satellite sites at district hospital level and community-based cancer care services.  
5  
6 105 Decentralisation is meant to be achieved in four different phases. The first phase entailed  
7  
8 106 decentralisation of chemotherapy services from Frere hospital (East London) and Inkosi Albert  
9  
10 107 Luthuli hospital (Durban, KwaZulu-Natal province) to NMAH in February 2018 for patients from  
11  
12 108 the OR Tambo district (the district where NMAH is located), and three other neighbouring  
13  
14 109 districts for patients in the Eastern Cape province. For Mpumalanga province, all  
15  
16 110 chemotherapy services were decentralised to RFH from Steve Biko and Kalafong hospitals in  
17  
18 111 the Gauteng province in August 2019. The two hospitals (NMAH and RFH) were assisted with  
19  
20 112 the hiring of radiation and medical oncologists, oncology trained professional nurses,  
21  
22 113 pharmacists, social workers, clinical psychologists, ultrasound and mammogram technicians,  
23  
24 114 and administrators. Equipment includes a spirometer, mammogram, ultrasound, colposcopy,  
25  
26 115 and a large loop excision of the transformation zone (LLETZ) machines in both hospitals.

27  
28 116 The second phase (current phase) entails decentralisation of chemotherapy services further  
29  
30 117 from NMAH to four Regional hospitals and one District hospital in the Eastern Cape. However,  
31  
32 118 only one of the five hospitals has been fully decentralised from February 2021, the other four  
33  
34 119 hospitals have achieved partial decentralisation with the procurement of equipment. For  
35  
36 120 Mpumalanga, the second phase entails decentralisation of chemotherapy services from RFH  
37  
38 121 to Witbank hospital for patients from two of their three districts from May 2021.

39  
40 122 The third phase will be full decentralisation of radiotherapy services from Frere hospital to  
41  
42 123 NMAH in the Eastern Cape and from Steve Biko and Kalafong hospitals to RFH, then Witbank  
43  
44 124 hospital in Mpumalanga. The fourth and final phase is the strengthening of district hospitals  
45  
46 125 and community-based services to manage aspects of cancer effectively from screening,  
47  
48 126 diagnosis, treatment, and palliative care support. This phase will also increase the pool of  
49  
50 127 oncology trained nurses and medical officers at primary care and district hospital level. These  
51  
52 128 latter two phases are still outstanding. Figure 1 summarises the timeline of the current  
53  
54 129 decentralisation process.

55  
56 130 Evidently, the current decentralised model of care is only limited to patients requiring  
57  
58 131 chemotherapy. It is hoped that the continued implementation of the decentralised model of  
59  
60 132 cancer care will improve patient experience and quality of cancer care and reduce morbidity  
133  
134 and mortality. However, data on patient demographic characteristics, epidemiological and  
135  
136 clinical profile of various cancers is lacking in these two hospitals. This study therefore seeks  
to conduct an assessment of demographic, epidemiological and clinical profile of various  
cancers in NMAH and RFH. Furthermore, the study aims to describe the current process and

1  
2  
3 137 its benefits/challenges, with hopes of expanding 'decentralisation of care' in terms of services  
4  
5 138 offered and number of decentralised hospitals.  
6  
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8

9 139 **Significance**

10  
11 140 South Africa's cancer services are generally urban-based and located in tertiary and  
12  
13 141 quaternary health centres with an underdeveloped cancer service platform at district hospital  
14  
15 142 and primary care levels. This means that patients needing cancer care have to travel long  
16  
17 143 distances to big cities/towns in order to access basic cancer care. This creates gaps in access  
18  
19 144 and quality of cancer care delivery between urban areas and rural areas. Decentralisation is  
20  
21 145 a result of operational observations (to our knowledge there is no formal research that was  
22  
23 146 done) such as long waiting times, delayed presentations, late diagnosis, patient complaints  
24  
25 147 on travelling and out of pocket costs, etc. It is therefore envisaged that this study will provide  
26  
27 148 insight on the distribution and types of cancers in areas where there is currently an  
28  
29 149 underestimation of the burden of disease and as a result incorrect understanding of the levels  
30  
31 150 of risk within the local populations. Moreover, establish the extent of the problem in both health  
32  
33 151 facilities and possibly justify the need for decentralisation of cancer care services and help  
34  
35 152 inform cancer preventive strategies in South Africa and other similar settings.

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153 **Objectives**

- 154 - To describe the socio-demographic characteristics of patients diagnosed with cancer in
- 155 the selected hospitals in the Eastern Cape and Mpumalanga provinces, South Africa.
- 156 - To determine and compare the incidence rate and prevalence of different types of cancer
- 157 in the selected hospitals.
- 158 - To determine and compare the geographic distribution of cancers in the Eastern Cape and
- 159 Mpumalanga provinces of South Africa.
- 160 - To determine the gaps between symptom development, first presentation at a health
- 161 institution, first cancer diagnosis, referral for definitive management and initiation on
- 162 treatment of patients diagnosed with cancer in South Africa's Eastern Cape and
- 163 Mpumalanga provinces.
- 164 - To determine the comorbid conditions of patients with a cancer diagnosis in South Africa's
- 165 Eastern Cape and Mpumalanga provinces.
- 166 - To determine the survival time of patients diagnosed with cancer in South Africa's Eastern
- 167 Cape and Mpumalanga provinces.

1  
2  
3 **168 METHODS AND ANALYSIS**  
4

5 **169 Research design**  
6  
7

8 170 This study will utilise a quantitative approach with a triangulation of a descriptive, exploratory  
9  
10 171 cross-sectional and a longitudinal cohort design to answer the study objectives. The  
11 172 triangulation of designs compensates for the potential limitations of a single design. This study  
12  
13 173 forms part of a bigger but yet to be published research project titled: “Exploring the feasibility,  
14 174 implications and outcomes of decentralising cancer care delivery in the Eastern Cape and  
15  
16 175 Mpumalanga provinces of South Africa”.

17  
18 176 Information will be sourced through two quantitative sub-studies, a cross-sectional survey with  
19  
20 177 cancer patients and an ambi-directional cohort document review. Below is a brief description  
21  
22 178 of the two sub-studies.

23  
24 179 Sub-study 1: Quantitative cross-sectional study

25  
26 180 A quantitative survey questionnaire will be administered on patients to assess demographic  
27  
28 181 characteristics, prevalence of different cancers in selected hospitals and compare geographic  
29  
30 182 distribution of cancers in the Eastern Cape and Mpumalanga provinces.

31  
32 183 Sub-study 2: Quantitative ambi-directional cohort study design

33  
34 184 Using the cancer patient registry (the registry is similar to a clinic logbook, but it is in an  
35  
36 185 electronic form) used in the study sites, a document review will be carried out on cancer  
37  
38 186 patients to ascertain the duration of cancer diagnosis, type of cancer(s), and the duration of  
39  
40 187 survival since admission to the oncology clinic (survival time). Figure 2 shows the ambi-  
41  
42 188 directional component of the study. Table 1 summarises the two sub-studies.

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46 190 *Table 1. Research methods summary*

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Sub-study	Study design	Objectives	Analysis
1	Cross-sectional study	<ul style="list-style-type: none"> <li>- Describe socio-demographic characteristics of patients.</li> <li>- Determine and compare the geographic distribution of cancers.</li> <li>- Determine cancer disease progression.</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency tables, percentages, and graphs to summarise categorical variables.</li> <li>• Mean, standard deviation and range to summarise</li> </ul>

		- Determine comorbid conditions of cancer patients.	normally distributed numerical variables; or Median and interquartile range to summarise skewed numerical variables.
2	Ambi-directional cohort study (document review)	<ul style="list-style-type: none"> <li>- Determine and compare the incidence rate and prevalence of different types of cancer in the selected hospitals.</li> <li>- Determine the comorbid conditions of patients with a cancer diagnosis.</li> <li>- Determine the survival time of patients diagnosed with cancer.</li> </ul>	<ul style="list-style-type: none"> <li>• Chi-squared statistics or Fisher's exact test to compare categorical variables between groups.</li> <li>• Parametric and/or non-parametric tests to compare numerical variables between groups.</li> <li>• Kaplan-Meier survival estimates, for survival time.</li> <li>• Hazard ratios for predictors of death.</li> </ul>

191

## 192 Study setting

193 The study is located in two rural provinces with a high degree of under-development and  
 194 marginalisation, namely Eastern Cape and Mpumalanga provinces in South Africa (8).  
 195 Generally, Eastern Cape and Mpumalanga provinces are characterised by lack of the  
 196 necessary infrastructure, resources, and expertise to provide quality, safe and accessible  
 197 radiotherapy, chemotherapy, palliative care services and surgical oncology services. Patients  
 198 from rural communities, who generally cannot afford private healthcare and are dependent on  
 199 state health services for cancer care, are compelled to travel long distances to the urban-  
 200 based tertiary or quaternary cancer care centres in order to access cancer care. The study  
 201 will be conducted in two hospitals, NMAH in Mthatha, Eastern Cape province and RFH in  
 202 Mbombela, Mpumalanga province. NMAH is one of ten central hospitals in South Africa and  
 203 is the only one that is located in a rural area. This level of care is meant to be a quaternary  
 204 level of care. RFH is a tertiary level of care hospital.

205 These are two hospitals in their respective provinces that refer their patients to seek quality  
 206 cancer care in hospitals which are further away. At times, it takes patients up to 3-days of  
 207 traveling when attending to their cancer care appointments. For example, cancer patients from  
 208 Mpumalanga's RFH travel more than 400 kilometres to the country's capital city, Pretoria.  
 209 While cancer patients from the Eastern Cape's NMAH travel more than 200 kilometres to East

1  
2  
3 210 London to access quality cancer care at an urban-based tertiary hospital. An anomaly, as  
4 211 NMAH is statutorily a level of care higher than a tertiary hospital.

6  
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### 9 213 **Population and Sampling**

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12 214 Purposive sampling was used to select the study hospitals. The hospitals were selected based  
13 215 on their levels of care, gazetted specialist packages of care and concerns about the existing  
14 216 package of cancer care services, and because they are currently implementing a  
15 217 decentralised model of cancer care delivery. Furthermore, the two hospitals aim to establish  
16 218 centres of excellence in cancer care, a network of cancer care satellite sites at district hospital  
17 219 level and community-based cancer care services.

20 220 A triangulation of approaches will be used to select study participants from the two hospitals.

22 221 Sub-study 1: Quantitative cross-sectional study (patients)

23 222 Systematic random sampling of patients visiting the oncology clinics' outpatient's department  
24 223 will be conducted by approaching every 5<sup>th</sup> patient on the queue until the sampling size has  
25 224 been reached. A total combined sample size for the two hospitals will be calculated using the  
26 225 equation,  $n = \frac{p(1-p)z^2}{d^2}$  for a one-sided 95% confidence interval and a 5% significance level  
27 226 ( $z=1.96$ ). Because the proportion ( $p$ ) of cancer patients who are seen in the respective  
28 227 hospitals is not known, this ( $p$ ) will be set at 50% and the margin of error ( $d$ ) will be set at 5%.  
29 228 This thus yields a total minimum sample size of 385. To factor for data entry errors a further  
30 229 10% (39) will be added to yield a desired sample size of 424 participants for the two sites.  
31 230 Participants will then be recruited proportionally to yield a sample size of 212 patients per  
32 231 site.

33 232 Sub-study 2: Quantitative ambi-directional cohort (document review)

34 233 Information will be extracted from the patient registry (the registry is similar to a clinic logbook,  
35 234 but it is in an electronic form) to respond to the questions on the extraction tool. All patients  
36 235 under the care of the unit at any stage between the 01<sup>st</sup> of March 2018 and the 28<sup>th</sup> of  
37 236 February 2022 will be included.

38 237

### 39 238 **Data collection**

40 239 A multi-method approach to data collection will be adopted to get a comprehensive picture  
41 240 on cancer in the selected hospitals in terms of demographic distribution of cancer, socio-

241 economic characteristics, prevalence, duration of diagnosis, etc. This approach will also  
242 compensate for the potential limitations of a single data collection method and to triangulate  
243 the data as a means of checking the consistency of the study findings.

#### 244 Sub-study 1: Quantitative cross-sectional study (patients)

245 The aim of this survey is to assess socioeconomic demographic characteristics of cancer  
246 patients, prevalence of different cancers in selected hospitals, and compare geographic  
247 distribution of the different cancers from the end-user's perspective. This sub-study will adopt  
248 and utilise a standardised and validated quantitative survey tool (Appendix A) to collect data  
249 from patients. The survey tool for patients has 51 questions developed through literature  
250 review and whose content validity was reviewed by three experts (one Occupational medicine  
251 specialist, a Public Health Medicine specialist, and an Oncologist). The questionnaire asks  
252 about the patient demographic profile and Epidemiological and clinical profile of various  
253 cancers. To test and ensure the effectiveness, the survey tool was also piloted amongst six  
254 patients in the two hospitals. Once the pilot study was done, all necessary adjustments were  
255 made to the data collection tool, thus ensuring that all questions will enhance the validity and  
256 reliability of the study findings. On clarity, there was 100% agreement among all three  
257 experts. On relevance only one of the three experts scored one question as irrelevant to  
258 result in an average score Content Validity Index of 0.99 (99%), which still renders the tool  
259 valid. Appendix C shows the experts' scoring in detail. This questionnaire has been translated  
260 into the local languages (isiXhosa, siSwati, and isiZulu) to accommodate participants who  
261 might not be comfortable with English.

#### 262 Sub-study 2: Quantitative ambi-directional cohort study (document review)

263 Using a data extraction tool (Appendix B), a document review will be conducted in addition to  
264 the survey questionnaire. The main aim of the document review is to ascertain information  
265 which could not be captured or verified from the survey questionnaire, including, duration of  
266 cancer diagnosis, types of cancer, and survival time of cancer patients from the date of  
267 diagnosis.

268

### 269 **Data management and analysis**

270 Quantitative data analysis will include capturing survey data into Microsoft Excel Office 2016  
271 and exporting the data into STATA version 17 (STATA Corp, College Station, Texas, USA) for  
272 analysis. Some descriptive and categorical data will be compared using frequencies,  
273 percentages, and graphs. Numerical data will be explored for normality using the Shapiro-Wilk  
274 test (9). If normally distributed the mean, range and standard deviation will be used. If not

1  
2  
3 275 normally distributed, then the median, and interquartile range (IQR) will be used. The Wilcoxon  
4 276 rank sum or an appropriate two-sample t-test will be used to compare the mean or median  
5 277 age of cancer patients by cancer type and between the two sites depending on the normality  
6 278 of the distribution of age and/or the equality of variances. A test for the equality of variances  
7 279 will be performed before use of the two-sample t-tests, if numerical variables are normally  
8 280 distributed. The two-sample t-test for independent samples will be carried out if variances are  
9 281 equal, and Satterthwaite's modified t-test used if the variances are not equal. The Chi-squared  
10 282 or Fisher's exact tests will be used depending on the value of the expected frequencies. If  
11 283 expected frequencies are  $<5$  in binary comparisons or if any one cell of a larger comparison  
12 284 has an expected frequency of  $<1$  or more than 20% of the cells of nominal categorical  
13 285 comparisons have an expected frequency of  $<5$  then the Fisher's exact test will be used.  
14 286 Kaplan-Meier survival estimates will be used to determine the survival time. Hazard ratios will  
15 287 be used to determine the predictors of death. The level of statistical significance will be set at  
16 288 p-value  $\leq 0.05$ . The 95% confidence interval will be used for the precision of estimates.  
17 289 Through triangulation, the analysis of the survey will seek to reproduce the cancer prevalence,  
18 290 epidemiological profiles and demographic characteristics determined in sub-study 1. These  
19 291 should be similar as determined by statistical methods (95% confidence interval and two-  
20 292 sample test of proportions).

### 293 **Limitations**

294 The study could be limited by the quality of data or poor information systems thus resulting in  
295 missing data. The assessment of the data at three time points will allow for the reduction of  
296 missing data as we will note suspicious entries and/or missing data and request for assistance  
297 with correction/filling of the missing data using the patient records or confirming from patients  
298 and/or family members. Missing data will be analysed using complete case analysis. The main  
299 outcome (cancer related deaths) could be limited by the absence of a mechanism linking to  
300 the death certificate, and/or autopsy. Every unspecified natural cause of death will therefore  
301 be considered to be related to the cancer as a direct or associated cause of death.

302

### 303 **Patient and public involvement**

304 The planning of the cancer service expansion involved community representatives through  
305 hospital boards in workshops and meetings. Patients will be informed of the study at all stages  
306 through consultations and public notices in the study sites.

307

### 308 **Ethics and dissemination**

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2  
3 309 Ethics approval was obtained from the Human Research Ethics Committees of the University  
4 310 of the Witwatersrand (M210211) and Walter Sisulu University, South Africa (040/2020). Site  
5 311 access approval has been obtained from the Provincial Health Research Committees of the  
6 312 Eastern Cape (EC\_202010\_012) and Mpumalanga (MP\_202011\_002) provinces  
7  
8 313 respectively. The study will abide by the 4 ethical principles of autonomy, beneficence, non-  
9 314 maleficence, and justice.

12  
13 315 Participants will be informed that their participation in this study is voluntary and that their  
14 316 confidentiality will be maintained throughout the study. Participants will also be assured that  
15 317 they are free to withdraw at any stage of the study and could opt-out of questions that they  
16 318 are not comfortable with. All identifying information will be removed. All electronic records will  
17 319 be accessed through a password encrypted database that only the principal investigator has  
18 320 access to. No direct incentives will be issued to participants. Before initiating the self-  
19 321 administered questionnaires, informed consent forms will be signed by all study participants.  
20 322 A waiver of consent has been attained for the document review. Information sheets and  
21 323 consent forms will be translated into relevant local languages (isiXhosa, Siswati and isiZulu).  
22 324 They will also be assured that data collected will be used only for the purposes of the study.

23  
24 325 Findings of the study will be disseminated widely to all stakeholders, including participants;  
25 326 and will be used to inform both provincial and national strategies to expand and sustain  
26 327 provision of high-quality cancer screening, diagnosis, treatment, and palliative services, and  
27 328 promote community-based cancer care programmes. Results will be presented at annual  
28 329 partner meetings, national and international conferences. Results will also be published in  
29 330 open access peer-reviewed journals to facilitate broad access to findings.

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### 40 41 332 **Authors' contributions**

42  
43 333 WC conceived the research, sourced funding, engaged stakeholders, completed the first draft  
44 334 of the manuscript and jointly approved final draft. ORM edited and commented on versions of  
45 335 the manuscript and incorporated and addressed feedback from the co-authors. SAM edited  
46 336 versions of the manuscript, provided methodological strategy, validated the quantitative  
47 337 survey tool, and jointly approved final draft. ZJ is the content expert, edited and commented  
48 338 on versions of the manuscript. BS facilitated ethics and research access approvals, edited  
49 339 version of the manuscript. VE validated the quantitative survey tool and edited versions of the  
50 340 manuscript. DH, LG, NW, CZ, LB, SK, JN, SS, OG and AM edited versions of the manuscript.

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60



1  
2  
3 343 This work was supported by the Bristol Myers Squibb Foundation grant number [1028].  
4  
5  
6 344

7  
8 345 **Competing interests**

9  
10 346 None declared  
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For peer review only

347 **REFERENCES**

- 348 1. Fitzmaurice C, Abate D, Abbasi N et al. Global, Regional, and National Cancer  
349 Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-  
350 Adjusted Life-Years for 29 Cancer Groups, 1990 to 2017: A Systematic Analysis for  
351 the Global Burden of Disease Study | Enhanced Rea. 2018.
- 352 2. World Health Organisation. Cancer factsheet Geneva. Cancer [Internet]. 2020 [cited  
353 2022 Feb 21]. Available from: [https://www.who.int/news-room/fact-](https://www.who.int/news-room/factsheets/detail/cancer)  
354 [sheets/detail/cancer](https://www.who.int/news-room/factsheets/detail/cancer)
- 355 3. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. 394 CA: A Cancer  
356 Journal for Clinicians Global Cancer Statistics 2018: GLOBOCAN Estimates of  
357 Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA CANCER J  
358 CLIN. 2018;68:394–424.
- 359 4. Ott JJ, Ullrich A, Mascarenhas M, Stevens GA. Global cancer incidence and mortality  
360 caused by behavior and infection. 2010 [cited 2022 Feb 21]; Available from:  
361 <https://academic.oup.com/jpubhealth/article/33/2/223/1588120>
- 362 5. Jha P. The hazards of smoking and the benefits of cessation: A critical summation of  
363 the epidemiological evidence in high-income countries. 2020; Available from:  
364 <https://doi.org/10.7554/eLife.49979>
- 365 6. National Department of Health. National Cancer Strategic Framework for South Africa  
366 2017 - 2022. National Cancer Strategic Framework for South Africa 2017 - 2022.  
367 2017.
- 368 7. International Agency for Cancer Research. Globocan South Africa Geneva. 2020;
- 369 8. Ngyende A. Statistical release (Revised). 2011 [cited 2022 Feb 22]; Available from:  
370 [www.statssa.gov.za](http://www.statssa.gov.za)
- 371 9. Vetter TR. Fundamentals of Research Data and Variables: The Devil Is in the Details.  
372 Anesth Analg. 2017;125(4):1375–80.

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3 373 **Acknowledgements**  
4

5 374 The authors would like to thank the support received from patient representatives and officials  
6  
7 375 of the participating hospitals and provinces for their assistance.  
8

9 376 **Patient consent for publication**  
10

11 377 Not required as this is a protocol. Patients to give consent before enrolment into the study.  
12  
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14 378

15  
16 379 *Figure 1. Timeline of the decentralisation process.*  
17

18 380 **Note.**  $\Omega$  = performed most surgical interventions even before decentralisation.

19  
20 381  $\uparrow$  = Performed this function before decentralisation.

21  
22 382  $\diamond$  = No provision of Chemotherapy in the hospitals due to lack of lamina flow.  
23

24 383  
25

26 384 *Figure 2. Ambi-directional cohort study for sub-study 2.*  
27

28 385 **Note.** Data collection will commence in January 2022 till the end of September 2022. Record review  
29 386 of patients diagnosed with cancer from 1 March 2018 will be done. Patients will be followed up for  
30 387 survival time either retrospectively (cancer related deaths between 1 March 2018 to January 2022), or  
31 388 prospectively (cancer related deaths from January 2022 until the study's end date, 30 September 2022).  
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# Appendices

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389

## Appendix A

391 Survey questionnaire (patients)

## Appendix B

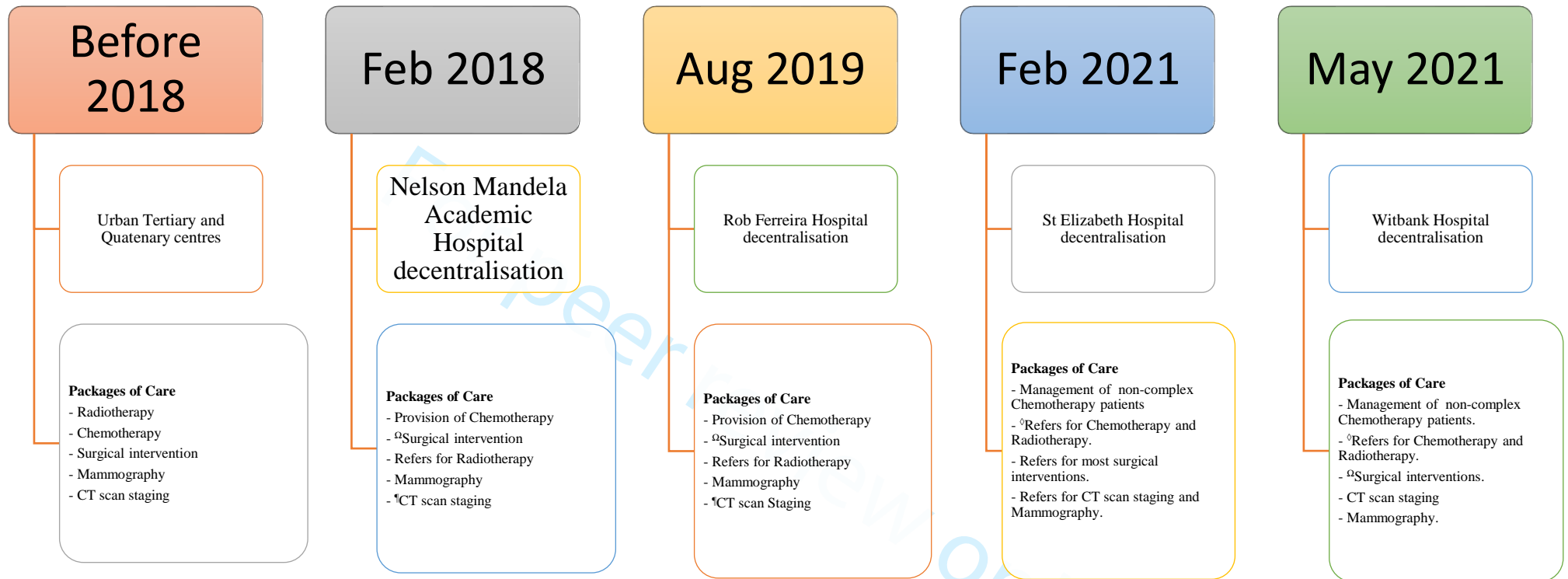
393 Document review template

## Appendix C

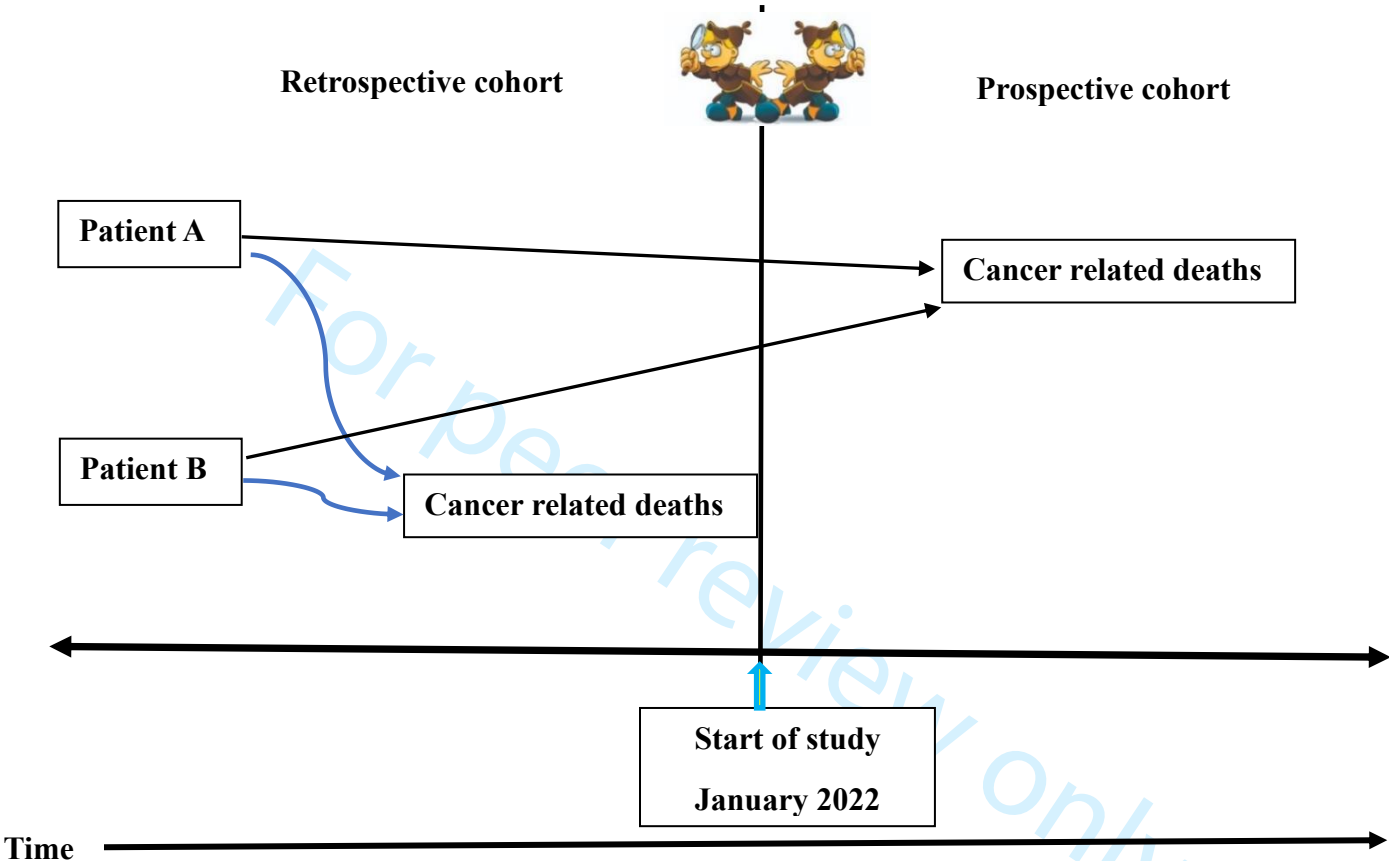
395 Questionnaire validation

For peer review only

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Note.  $\Omega$  = performed most surgical interventions even before decentralisation.  
 $\diamond$  = Performed this function before decentralisation.  
 $\diamond$  = No provision of Chemotherapy in the hospitals due to lack of lamina flow.



Note. Data collection will commence in January 2022 till the end of September 2022. Record review of patients diagnosed with cancer from 1 March 2019 will be done. Patients will be followed up for survival time either retrospectively (cancer related deaths between 1 March 2019 to January 2022), or prospectively (cancer related deaths from January 2022 until the study's end date, 30 September 2022).

**Appendix A**

Survey questionnaire (patients)

**INSTRUCTIONS:** Fill in the blank spaces with a tick where appropriate.**Date of Administration:** \_\_\_\_\_**Section 1: demographic profile**

## 1. Gender

1	Female	
2	Male	

## 2. Date of Birth

Dd/Mm/Yy: 

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## 3. Ethnicity

1	African	
2	White	
3	Indian	
4	Coloured	
5	Other: specify	

## 4. Marital status

1	Never Married	
2	Married (including lobola)	
3	Divorced/Separated	
4	Widowed	
5	Cohabiting	

5. What is the highest standard/grade or level you have passed at school or tertiary education?

-----

6. Are you currently studying?

1	Yes	
2	No	

7. What is your current level of study? .....

8. Are you employed?

a)

1	Yes	
2	No	

b) If employed, what type of work do you do? .....

9. Source of income (tick all appropriate)

1	2	3	4	5	6	7	8	9
Job	Old Age Grant	Disability Grant	Other Pension	Spousal support	Support from children	Child support grant	None	Other (Specify)

10. What is your gross family income each month (that is, before tax)?

1	No income		7	R6 401 – R12 800	
2	R1 – R400		8	R12 801 – R25 600	
3	R401 – R800		9	R25 601 – R51 200	
4	R801 – R1 600		10	R51 201 – R102 400	
5	R1 601 – R3 200		11	R102 401 – R204 800	
6	R3 201 – R6 400		12	More than R204 800	

11. What is the name of your place of residence? .....

12. Which health facility referred you here (Name)?

.....



**Section 2: Epidemiological and clinical profile of various cancers**

13a. Do you have a family history of cancer?

1	2	3
Yes	No /	Unsure

13b. If yes to above, how are you related to the family member(s) who has the cancer diagnosis?

\_\_\_\_\_

13c. What type of cancer(s) does the family member(s) have?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

14. Do you smoke? (tick all appropriate)

a)

1	Yes	
2	No	

b) If Yes, when did you start smoking?

Year: \_\_\_\_\_

c) On average, how many cigarettes do you smoke in a day? \_\_\_\_\_

d) If No, have you ever smoked?

1	Yes	
2	No	

e) For how long did you smoke? \_\_\_\_\_

f) How many did you smoke in a day? \_\_\_\_\_

1	Once	
2	Twice	
3	Three time	
4	More than 3 times	

g) Did you stop smoking?

1	Yes	
2	No	

h) How long ago did you stop smoking? \_\_\_\_\_

15. Do you drink alcohol?

a)

1	Yes	
2	No	

b) Did you drink alcohol before?

1	Yes	
2	No	

16. Do you exercise (physical) on a regular basis?

1	Yes	
2	No	

17. Have you ever worked in mines?

1	Yes	
2	No	

18. How long in years did you work in mines? .....

19. Which mines (tick all that apply)? .....

1	Gold	
2	Platinum	
3	diamond	
4	Coal	
5	Other (specify)	

20. Please indicate if your family has a history of any cancer/s below?

1	Breast cancer		6	Uterus cancer	
2	Lung cancer		7	Colon cancer	
3	Cervical cancer		8	Ovarian cancer	
4	Prostate Cancer		9	Other (specify)	
5	Oesophagus cancer		10	No history of cancer in my family	

21. Before you were told you needed to go to hospital about cancer, how many times did you see other doctors or health professionals about the health problem caused by cancer?

		1x	2x	3x	4x	5x	Other
1	I visited my local clinic						
2	I visited my local hospital						
3	I saw my local private doctor						
4	I saw my traditional healer/doctor/ Isangoma						
5	Other (specify):						

22. How do you feel about the length of time you had to wait before your first appointment with a hospital doctor or clinic doctor?

1	I was seen as soon as I thought was necessary	
2	I should have been seen a bit sooner	

23. How long was it from the time you identified symptoms?

-----

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24. Did your symptoms get better or worse or were the same while you were waiting for your first appointment with a hospital doctor?

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25. What type of cancer(s) were you diagnosed with?

-----

-----

26. When was your cancer(s) diagnosed?

-----

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1  
2  
3 27. What health problems or symptoms did you notice at first?  
4  
5  
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.....  
.....  
.....

8 28. Who first told you that you had cancer?  
9

1	A hospital doctor	
2	A hospital nurse	
3	A GP (family doctor)	
4	Another health professional (specify)_____	
5	A friend or relative	
6	Nobody – I worked it out for myself	
7	Cannot remember	

25  
26 29. When you were first told that you had cancer, had you been told you could bring a family member or friend with you?  
27

1	Yes	
2	No	
3	It was not necessary	
4	I was told by phone or letter	
5	Don't know / Can't remember	
6	Other (specify)_____	

38  
39  
40 30. How do you feel about the way you were told you had cancer?  
41  
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.....  
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.....

46 30. Did you understand the explanation of what was found with you?  
47

1	Yes	
2	No	

48  
49  
50 31. When you were told you had cancer, were you given written information about the type of cancer you had?  
51  
52  
53  
54  
55

1	Yes	
2	No	

32. Before your cancer treatment started, were you given a choice of different types of treatment?

1	Yes	
2	No, but I would have liked a choice	
3	I was not given a choice because only one type of treatment was suitable for me	
4	Not sure / Can't remember	
5	Missing	

33. Do you think your views were taken into account when the team of doctors and nurses caring for you were discussing which treatment you should have?

1	Yes	
2	No	

34. Were the possible side effects of treatment(s) explained in a way you could understand?

1	Yes	
2	No	

35. Before you started your treatment, were you given verbal/written information about the side effects of treatment(s)?

1	Yes	
2	No	

36. Were you involved as much as you wanted to be in decisions about your care and treatment?

1	Yes	
2	No	

37a. During the last 12 months, have you had an operation (such as removal of a tumour or lump) at one of the hospitals named in the covering letter?

1	Yes	
2	No	
3	Not sure	

1  
2  
3 b. Before you had your operation, did a member of staff explain what would be done during the operation?  
4

5 6 7 8 9	1	Yes	
	2	No	

10 38. The last time you went into hospital for a cancer operation, was your admission date changed to a later date by the  
11 hospital?  
12

13 14 15 16 17 18 19	1	Yes	
	2	No	

20 39. Beforehand, were you given written/verbal information about your operation?  
21

22 23 24 25 26	1	Yes	
	2	No	

27 40. After the operation, did a member of staff explain how it had gone in a way you could understand?  
28

29 30 31 32 33	1	Yes	
	2	No	

34 41. As far as you know, was the hospital or your doctor that referred you for cancer treatment given enough information  
35 about your condition and the treatment you had at the hospital?  
36

37 38 39 40 41 42 43	1	Yes	
	2	No	
	3	Don't know / Can't remember	

44 42. Do you think the doctors and nurses at your local hospital or clinic did everything they could to support you while you  
45 were in their care?  
46

47 48 49 50 51 52 53 54 55 56 57 58 59 60	1	Yes	
	2	No	

**Appendix B**

Document review template

##	Date of birth	Province	Site	Child	Patient Classification	Referred patient	Referral Type	Internal Referral Department	Referring Hospital_Mpumalanga	-
1.										
2.										
3.										
4.										
5.										

##	Referring Hospital_EC	Referral Hospital	Gender	Race	Citizenship	Medical Aid	Postal code	Employed	Source of income	Specify Occupation	-
6.											
7.											
8.											
9.											
10.											

##	Previous work in mine	Number of Years worked in mines	Marital Status	Date of 1st oncology visit	Date of diagnosis	Cancer diagnosis 1	ICD10_Cancer diagnosis1	Cancer diagnosis1 - Stage	Cancer diagnosis 2	ICD10_Cancer diagnosis2	-
11.											
12.											
13.											
14.											
15.											

##	Cancer diagnosis2_Stage	Cancer diagnosis3	ICD10_Cancer diagnosis3	Cancer diagnosis3_Stage	Chemotherapy	Onco_Drug1	Onco_Drug2	Neupogen	Hormonal Therapy	Blood Transfusion	-
16.											
17.											
18.											
19.											
20.											

##	Radiotherapy	PET_Bone Scan	Palliative Care	Social support	Psychological support	HIV	Hypertension	Diabetes Mellitus	COPD	Asthma	-
21.											
22.											
23.											
24.											
25.											

##	Other Chronic Disease1_Name	Other Chronic Disease2_Name	Family history of cancer	Previous Smoker	Current Smoker	Number of years of smoking	Number of cigarettes smoked in a day	Weight in Kg	Height in Centimetres	Date_of_Current_Visit1	-
26.											
27.											
28.											
29.											
30.											

##	Follow-up Date1	RIP Date	Date_of_Current_Visit2	Follow-up Date2	---
31.					
32.					
33.					
34.					
35.					



Appendix C: Questionnaire validation

	Relevance						Clarity					
	Expert _1	Expert _2	Expert _3	Experts in agreeme nt	Item Content Validity Index (I- CVI)	Universa l Agreeme nt (UA)	Expert _1	Expert _2	Expert _3	Experts in agreeme nt	Item Conte nt Validit y Index (I- CVI)	Universa l Agreeme nt (UA)
<b>Survey questionnaire (patients)</b> <b>INSTRUCTIONS:</b> Fill in the blank spaces with a tick where appropriate. <b>Date of Administration:</b> _____												
<b>Section 1: demographic profile</b>												
<b>Question</b>												
1. Gender 1 Female 2 Male	4	4	4	3	1	1	4	3	4	3	1	1
2. Date of Birth Dd/Mm/Yy: _____ _	4	3	4	3	1	1	4	4	4	3	1	1
3. Ethnicity 1 African 2 White 3 Indian 4 Coloured 5 Other: specify	4	4	4	3	1	1	4	4	4	3	1	1
4. Marital status 1 Never Married 2 Married 3 Divorced/ Separated 4 Widowed 5 Cohabiting	3	3	4	3	1	1	4	3	4	3	1	1
5. What is the highest standard/grade you have attended in education? ----- -----	4	4	3	3	1	1	4	3	4	3	1	1
6. Are you currently studying? 1 Yes 2 No	3	3	3	3	1	1	4	3	3	3	1	1
7. What is your current level of study? ----- -----	3	3	3	3	1	1	4	3	4	3	1	1
8. Are you employed? a) 1 Yes 2 No b) If employed, what type of employment? -- -----	4	4	4	3	1	1	4	4	4	3	1	1

9. Source of income (tick all appropriate) 1 Job 2 Old Age Grant 3 Disability Grant 4 Other Pension 5 Spousal support 6 Support from children 7 Child support grant 8 None 9 Other	4	4	4	3	1	1	4	4	4	3	1	1
10. What is your residential area? Name of town/administrative area: ----- -	3	4	3	3	1	1	4	3	3	3	1	1
11. Referring facility: 1 Clinic 2 Community Health Centre 3 District Hospital 4 Regional Hospital 5 Private General practitioner 6 Private hospital 7 Other (specify):	4	4	4	3	1	1	4	4	4	3	1	1
<b>Section 2: Epidemiological and clinical profile of various cancers</b>				3	1	1				3	1	1
1. Do you have a family history of cancer? 1 Yes 2 No 3 Unsure	4	4	4	3	1	1	4	4	4	3	1	1
2. Do you smoke? (tick all appropriate) 1 Yes 2 No	4	4	4	3	1	1	4	3	4	3	1	1
2b) If Yes, when did you start smoking? Year: _____	4	3	4	3	1	1	4	3	3	3	1	1
2c) On average, how many cigarettes do you smoke in a day?	4	3	4	3	1	1	4	3	4	3	1	1
2d) If No, have you ever smoked?	4	3	4	3	1	1	4	3	4	3	1	1
2e) For how long did you smoke?	4	3	4	3	1	1	4	4	4	3	1	1

2f) How many did you smoke in a day? 1 Once 2 Twice 3 Three time 4 More than 3 times	4	3	4	3	1	1	4	3	3	3	1	1
2g) Did you stop smoking? 1 Yes 2 No	4	3	3	3	1	1	4	4	3	3	1	1
3. Do you drink alcohol? a) 1 Yes 2 No	4	4	4	3	1	1	4	4	4	3	1	1
4. Do you exercise (physical) on a regular basis? 1 Yes 2 No	4	4	3	3	1	1	4	4	4	3	1	1
4b) Did you drink alcohol before? 1 Yes 2 No	4	4	4	3	1	1	4	4	4	3	1	1
5. Have you ever worked in mines? 1 Yes 2 No	4	4	4	3	1	1	4	3	4	3	1	1
6. How long in years did you work in mines? -----	4	4	4	3	1	1	4	4	4	3	1	1
7. Which mines? Gold, diamond coal, mixed? -----	4	4	4	3	1	1	4	4	4	3	1	1
8. a) Please indicate if your family has a history of any cancer/s below? 1 Breast cancer 5 Oesophagus cancer 2 Lung cancer 6 Colon cancer 3 Cervical cancer 7 Ovarian cancer 4 Prostate Cancer 8 Other (specify) 9 No history of cancer in my family  b) If you have history of cancer in your family, indicate who in the family had these cancer(s)?	4	4	4	3	1	1	4	4	4	3	1	1

9. Before you were told you needed to go to hospital about cancer, how many times did you see your GP (family doctor)/ clinic about the health problem caused by cancer? 1x 2x 3x 4x 5x Other 1 I visited my local clinic 2 I saw my local private doctor 3 I saw my traditional healer/doctor/ Isangoma 4 Other (specify):	4	4	4	3	1	1	4	4	4	3	1	1
10. How do you feel about the length of time you had to wait before your first appointment with a hospital doctor or clinic doctor? 1 I was seen as soon as I thought was necessary 2 I should have been seen a bit sooner	4	2	4	2	0,67	0	4	3	4	3	1	1
11. How long was it from the time you identified symptoms? ---- -----	4	4	4	3	1	1	3	4	3	3	1	1
12. Did your symptoms get better or worse or were the same while you were waiting for your first appointment with a hospital doctor? ----	4	4	4	3	1	1	4	4	4	3	1	1
13. What type of cancer(s) were you diagnosed with? ---	4	4	4	3	1	1	4	4	4	3	1	1
14. When was your cancer(s) diagnosed? ----- ----	4	4	4	3	1	1	4	4	4	3	1	1
15. What health problems or symptoms did you notice at first? -----	4	4	4	3	1	1	4	3	4	3	1	1

16. Who first told you that you had cancer? 1 A hospital doctor 2 A hospital nurse 3 A GP (family doctor) 4 Another health professional 5 A friend or relative 6 Nobody – I worked it out for myself 7 Cannot remember	3	4	4	3	1	1	4	4	4	3	1	1
17. When you were first told that you had cancer, had you been told you could bring a family member or friend with you? 1 Yes 2 No 3 It was not necessary 4 I was told by phone or letter 5 Don't know / Can't remember 6 Missing	3	4	4	3	1	1	3	4	4	3	1	1
18. How do you feel about the way you were told you had cancer? -----	4	4	4	3	1	1	4	4	4	3	1	1
19. Did you understand the explanation of what was found with you? -----	4	4	4	3	1	1	4	4	4	3	1	1
20. When you were told you had cancer, were you given written information about the type of cancer you had? -----	4	4	4	3	1	1	4	4	4	3	1	1
21. Before your cancer treatment started, were you given a choice of different types of treatment? 1 Yes 2 No, but I would have liked a choice 3 I was not given a choice because only one type of treatment was suitable for me 4 Not sure / Can't remember 5 Missing	4	4	4	3	1	1	4	4	4	3	1	1

22. Do you think your views were taken into account when the team of doctors and nurses caring for you were discussing which treatment you should have? -----	4	4	4	3	1	1	4	4	4	3	1	1
23. Were the possible side effects of treatment(s) explained in a way you could understand? ----	4	4	4	3	1	1	4	4	4	3	1	1
24. Before you started your treatment, were you given verbal/written information about the side effects of treatment(s)? --	4	4	4	3	1	1	4	4	3	3	1	1
25. Were you involved as much as you wanted to be in decisions about your care and treatment? -----	4	4	4	3	1	1	4	4	4	3	1	1
26. a) During the last 12 months, have you had an operation (such as removal of a tumour or lump) at one of the hospitals named in the covering letter? 1 Yes 2 No 3 Not sure	4	4	4	3	1	1	4	4	4	3	1	1
26.b) Before you had your operation, did a member of staff explain what would be done during the operation? -----	4	4	4	3	1	1		4	4	3	1	1
27. The last time you went into hospital for a cancer operation, was your admission date changed to a later date by the hospital? ---	4	4	4	3	1	1	4	4	4	3	1	1
28. Beforehand, were you given written/verbal information about your operation? ---	4	4	4	3	1	1	3	4	4	3	1	1

29. After the operation, did a member of staff explain how it had gone in a way you could understand? ---- -----	4	4	4	3	1	1	4	4	4	3	1	1	
30. As far as you know, was your doctor given enough information about your condition and the treatment you had at the hospital? 1 Yes 2 No 3 Don't know / Can't remember	4	3	4	3	1	1	3	3	4	3	1	1	
31. Do you think the doctors and nurses at your general practice/local clinic did everything they could to support you while you were at general practice or local clinic? -----	4	4	4	3	1	1	4	3	4	3	1	1	
<b>Total</b>					<b>50,67</b>	<b>50</b>					<b>51</b>	<b>51</b>	
Average Score-Content Validity Index (S-CVI) = I-CVI/n					<b>0,993529</b>	<b>0,98</b>					<b>S-CVI</b>	<b>1</b>	<b>1</b>
n = 51													
<b>Proportion relevance</b>													
Expert 1	1												
Expert 2	0,98												
Expert 3	1												
<b>Proportion Clarity</b>													
Expert 1	1												
Expert 2	1												
Expert 3	1												

<b>Likert Scale:</b>	
<b>Relevance</b>	<b>Clarity</b>
1 = Item is not relevant to the measured domain	1 = Item is not clear
2 = Item is somewhat relevant to the measured domain	2 = Item needs some revision
3 = Item is quiet relevant to the measured domain	3 = Item is clear but need some minor revision
4 = Item is highly relevant to the measured domain	4 = Item is very clea