

Actuarial Society of South Africa

EXAMINATION

25 October 2022

Subject N211 — Communications

Time allowed: Three hours and fifteen minutes, plus an additional five minutes to allow for uploading your file on the ASSA Exam Platform

Total marks: 100

INSTRUCTIONS TO THE CANDIDATE

1. Ensure that you are logged in and authenticated through Examyty before you attempt the examination.
2. Ensure that you have your exam permit handy. It reflects your candidate number to input as part of the examination.
3. The question paper is only available on the ASSA Exam Platform as a PDF download and may not be printed.
4. You will be provided with Word and PowerPoint templates within the ASSA Exam Platform to download and use to complete your questions. You may only use the files provided to you. You may not access any file from your computer, nor open any browser during the examination.
5. An Excel spreadsheet with data will be available within the ASSA Exam Platform to use in Question 1, but will not be uploaded and used for the marking process.
6. Ensure that your candidate number appears in the Header (Word template) and Footer (PowerPoint template). [Double-click on the header/footer, input your candidate number only, then press “Esc” to close the header/footer.] Do not use your name or member number anywhere in your answer document nor as file name.
7. You are strongly encouraged to use the first 15 minutes as reading time only; however, you may start answering the paper whenever you are ready.
8. Mark allocations are shown in brackets.
9. Add your word count to the bottom of Question 1. Include words and numbers in tables and graphs.
10. Attempt all questions. Save your work continuously during the examination.
11. You may not use any other material (e.g. a Formulae and Tables book) during the examination. Any such information that may be required will be provided to you in the examination.

12. Upload your answer files into the ASSA Exam Platform before the examination time expires. Take this into account when planning your review and submission. There will be no time announcements.
13. Once you have added your file, you must click on **Finish Attempt** to save your file. You will still be allowed to go back and make changes (**Review Attempt**) if you have time.
14. Once you are satisfied with your uploaded file, click **Finish Attempt** and **Finish All and Submit**. No further changes will be possible.
15. Show calculations where appropriate. You may use blank paper to make notes. This paper must not be scanned as part of your answer script.

Note: The Actuarial Society of South Africa will not be held responsible for loss of data where candidates have not followed instructions as set out above.

END OF INSTRUCTIONS

QUESTION 1

A friend has sent you the following extracts from an article that was published on 18 February 2022 in a local US newspaper, the Houston Chronicle, regarding the Omicron variant of Covid. He is concerned that all the facts have not been considered and would like you, as an actuary specialising in healthcare data analysis for your company HealthCo, to write a letter to the editor, Mr John Wayne, to explain the shortcomings of the article.

The latest Omicron-variant, first identified in late-November by South African scientists has renewed concern regarding Covid-19 infections and possible further public health restrictions. While South Africa has certainly been at the forefront of Covid-research, the reporting of late seems to have lost its early accuracy.

There are two main sources of Covid-related severity reporting available. The first source is published by the National Department of Health (NDoH) on Covid cases and Covid-related deaths. The second source is a well-respected model of excess natural deaths published by the South African Medical Research Council (SAMRC).

| <i>Covid Wave</i> | <i>Wave Name</i> | <i>Duration of wave impact</i> |
|--------------------------|-------------------------|---------------------------------------|
| <i>1</i> | <i>Alpha</i> | <i>May 2020 – Sept 2020</i> |
| <i>2</i> | <i>Beta</i> | <i>Dec 2020 – Mar 2021</i> |
| <i>3</i> | <i>Delta</i> | <i>May 2021 – Oct 2021</i> |
| <i>4</i> | <i>Omicron</i> | <i>Dec 2021 - ?</i> |

During the first three waves of Covid infections in South Africa, weekly deaths (NDoH) and excess deaths (SAMRC) largely coincided with one another in terms of timing, if not in number. The reporting during February 2022 shows a different story. Calculated excess deaths have peaked and are declining, but reported Covid deaths are increasing at a rapid rate

The article goes on to infer that Omicron was potentially devastating.

You recently attended a virtual presentation (some slides included below) that outlined facts regarding South African Covid death reporting. You were also able to retrieve the excess and reported death data used in the above article from various sources (as in the Excel spreadsheet available for download in the ASSA Exam Platform and available in table format on page 4 of this document).

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Appendix A: Covid Mortality Data

| Week no | WEEK (starting on) | Excess deaths | Reported Covid Deaths |
|---------|--------------------|---------------|-----------------------|
| 19 | 03-May-20 | 35 | 63 |
| 20 | 10-May-20 | 60 | 75 |
| 21 | 17-May-20 | 154 | 146 |
| 22 | 24-May-20 | 87 | 236 |
| 23 | 31-May-20 | 172 | 309 |
| 24 | 07-Jun-20 | 530 | 471 |
| 25 | 14-Jun-20 | 1586 | 454 |
| 26 | 21-Jun-20 | 2374 | 536 |
| 27 | 28-Jun-20 | 3361 | 613 |
| 28 | 05-Jul-20 | 4732 | 945 |
| 29 | 12-Jul-20 | 6496 | 977 |
| 30 | 19-Jul-20 | 6677 | 1707 |
| 31 | 26-Jul-20 | 5534 | 1498 |
| 32 | 02-Aug-20 | 3999 | 2057 |
| 33 | 09-Aug-20 | 2695 | 1467 |
| 34 | 16-Aug-20 | 2346 | 1310 |
| 35 | 23-Aug-20 | 1575 | 994 |
| 36 | 30-Aug-20 | 1162 | 798 |
| 37 | 06-Sep-20 | 542 | 648 |
| 38 | 13-Sep-20 | 409 | 513 |
| 39 | 20-Sep-20 | 577 | 436 |
| 40 | 27-Sep-20 | 289 | 562 |
| 41 | 04-Oct-20 | 753 | 735 |
| 42 | 11-Oct-20 | 1164 | 735 |
| 43 | 18-Oct-20 | 1094 | 536 |
| 44 | 25-Oct-20 | 832 | 332 |
| 45 | 01-Nov-20 | 1036 | 513 |
| 46 | 08-Nov-20 | 1657 | 417 |
| 47 | 15-Nov-20 | 1620 | 639 |
| 48 | 22-Nov-20 | 1380 | 594 |
| 49 | 29-Nov-20 | 2175 | 628 |
| 50 | 06-Dec-20 | 3540 | 1039 |
| 51 | 13-Dec-20 | 4643 | 1433 |
| 52 | 20-Dec-20 | 7433 | 1982 |
| 53 | 27-Dec-20 | 10626 | 2654 |
| 1 | 03-Jan-21 | 14069 | 3649 |
| 2 | 10-Jan-21 | 16125 | 4027 |
| 3 | 17-Jan-21 | 13125 | 3723 |
| 4 | 24-Jan-21 | 7436 | 3377 |
| 5 | 31-Jan-21 | 4905 | 2229 |
| 6 | 07-Feb-21 | 3017 | 1641 |
| 7 | 14-Feb-21 | 2628 | 1119 |
| 8 | 21-Feb-21 | 1965 | 1001 |
| 9 | 28-Feb-21 | 1730 | 706 |
| 10 | 07-Mar-21 | 1803 | 614 |
| 11 | 14-Mar-21 | 1167 | 821 |
| 12 | 21-Mar-21 | 1385 | 566 |
| 13 | 28-Mar-21 | 1237 | 306 |

| Week no | WEEK (starting on) | Excess deaths | Reported Covid Deaths |
|---------|--------------------|---------------|-----------------------|
| 14 | 04-Apr-21 | 1479 | 302 |
| 15 | 11-Apr-21 | 1582 | 455 |
| 16 | 18-Apr-21 | 1557 | 414 |
| 17 | 25-Apr-21 | 1530 | 281 |
| 18 | 02-May-21 | 1610 | 281 |
| 19 | 09-May-21 | 1876 | 496 |
| 20 | 16-May-21 | 1914 | 589 |
| 21 | 23-May-21 | 2574 | 591 |
| 22 | 30-May-21 | 3214 | 566 |
| 23 | 06-Jun-21 | 3322 | 777 |
| 24 | 13-Jun-21 | 2981 | 884 |
| 25 | 20-Jun-21 | 4898 | 1188 |
| 26 | 27-Jun-21 | 6637 | 1729 |
| 27 | 04-Jul-21 | 8269 | 2631 |
| 28 | 11-Jul-21 | 10348 | 2538 |
| 29 | 18-Jul-21 | 10154 | 2812 |
| 30 | 25-Jul-21 | 8940 | 2525 |
| 31 | 01-Aug-21 | 6885 | 2610 |
| 32 | 08-Aug-21 | 5220 | 2246 |
| 33 | 15-Aug-21 | 5526 | 2382 |
| 34 | 22-Aug-21 | 4843 | 2210 |
| 35 | 29-Aug-21 | 4642 | 1882 |
| 36 | 05-Sep-21 | 3326 | 1408 |
| 37 | 12-Sep-21 | 2320 | 1365 |
| 38 | 19-Sep-21 | 1992 | 885 |
| 39 | 26-Sep-21 | 1549 | 752 |
| 40 | 03-Oct-21 | 1151 | 539 |
| 41 | 10-Oct-21 | 1435 | 295 |
| 42 | 17-Oct-21 | 1171 | 327 |
| 43 | 24-Oct-21 | 839 | 249 |
| 44 | 31-Oct-21 | 1541 | 156 |
| 45 | 07-Nov-21 | 1553 | 157 |
| 46 | 14-Nov-21 | 1273 | 96 |
| 47 | 21-Nov-21 | 1234 | 219 |
| 48 | 28-Nov-21 | 1916 | 174 |
| 49 | 05-Dec-21 | 1739 | 151 |
| 50 | 12-Dec-21 | 2633 | 229 |
| 51 | 19-Dec-21 | 3585 | 428 |
| 52 | 26-Dec-21 | 3589 | 425 |
| 1 | 02-Jan-22 | 2765 | 622 |
| 2 | 09-Jan-22 | 2342 | 907 |
| 3 | 16-Jan-22 | 1510 | 785 |
| 4 | 23-Jan-22 | 1217 | 1070 |
| 5 | 30-Jan-22 | 1273 | 912 |
| 6 | 06-Feb-22 | 936 | 1168 |
| 7 | 13-Feb-22 | 826 | 1632 |
| 8 | 20-Feb-22 | 1005 | 574 |
| 9 | 27-Feb-22 | 991 | 352 |
| 10 | 06-Mar-22 | 1044 | 169 |
| 11 | 13-Mar-22 | 752 | 167 |
| 12 | 20-Mar-22 | 970 | 86 |

SA Covid Mortality Reporting as at 20 February 2022

- NDoH Data Covid-related case and death data are reported daily.
- SAMRC estimates excess deaths based on the difference between
 - Deaths reported to the department of home affairs by applicants for death certificates
 - Previous mortality statistics from 2015 – 2019
- SAMRC provides weekly updates.

BUT

- NDoH deaths are published by date of reporting/audit and not by date of death.
- All deaths in the SAMRC data are by date of death.
- Omicron deaths so far are better than expected due to
 - Widespread population immunity
 - Effective vaccination program

Covid mortality reporting and NDoH Audits

- Due to an ongoing audit of Covid-19 deaths in South Africa over the past 6 weeks, a large number of backlogged deaths were reported.
- There is no indication of how far back the audit goes.
- Current reported deaths by week are unreliable as a measure of current pandemic severity.
- The identification of these historic deaths is part of the process to align the provincial deaths with excess deaths.
- Backlogged deaths are those that occurred more than 48 hours before they were reported.

Use the information in the article and presentation to compose a letter to the editor outlining the facts of the situation in South Africa and how the data has been misinterpreted. You should include a detailed graph, based on the data provided in the Excel sheet, with a clear explanation for the anomaly evident in comparing the data. Provide an adequate explanation for the difference in Covid death experience in the last wave compared to preceding waves.

Write your response on a company letterhead. Create suitable recipient address and format details where needed. Your letter should be between 550 – 600 words in length. Add your word count to the bottom of the question. Count from the start of the subject line to the closing sentence (including words and numbers in tables and graphs) but excluding addresses or complimentary close/signature.

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[Total 50]

QUESTION 2

You are a partly qualified actuary working for XYZ Labour Management Consultancy as a technical consultant. The WC Gardening Services Association is one of your regular clients. It is a voluntary organisation of owners of gardening service businesses in the Western Cosmos, a province in Lalaland. While Association members make independent decisions on the conditions of service and salaries of employees, they use information from the association to support their negotiations.

Some Association members are currently discussing the level of annual salary increase to implement in January 2023. Mrs Mhlanga, the Association's chairperson, and other Association members would like to give inflation-related increases to their workers if possible. She has requested an estimate of the likely level of inflation over 2022 from XYZ. She was surprised to hear that the annual inflation rate for 2022 is likely to be 10.5%. This is contrary to her experience when buying the basics for her family. Mrs Mhlanga's employees seem to be experiencing even higher inflation than her as their spending patterns differ from hers. Employees' spending on work-related travel is particularly high when compared to Association members.

Your investigation into published projected inflation figures yielded the following information about their calculation from the Statistician General's Office:

- The official figure is primarily based on estimated weighted average of household spending in 2022.
- The weighted average is calculated as follows:

$$\bullet \frac{\sum_{\text{households}} \sum_{\text{spend category}} \left(\frac{\text{Household income} \times \text{Weight per household per spend category}}{\times \text{Inflation per spend category}} \right)}{\sum_{\text{households}} (\text{Household income})}$$

- Monthly spend diaries were accurately maintained by households who participated in the study.
- Participating households were selected to be representative of the Lalaland population in terms of geographical location, household demographics and income spread as inflation experience differs based on these characteristics.
- Inflation per spend category is based on prices across selected providers.

You have gathered the following information about estimated inflation related to the approximate average spending patterns of Association members and employees:

| Spending category | Projected 2022 inflation rate per spending category | Average annual household spend by Association members | Average annual household spend by employees |
|-----------------------|---|---|---|
| Rent | 5% | 70 000 | 15 000 |
| Food and beverages | 12% | 66 000 | 15 000 |
| Work-related travel | 25% | 40 000 | 21 000 |
| Clothing | 8% | 10 000 | 3 000 |
| Entertainment/leisure | 9% | 14 000 | 6 000 |

You have been requested to give a PowerPoint presentation of eight to ten slides to interested members of the WC Gardening Services Association explaining why individual households' experience of inflation differs from official inflation figures. Draft a presentation that focuses on this question using appropriate examples. Start by giving a brief explanation of the concept behind official inflation rates. Continue with the projected inflation experience of Association members and their employees. Do not mention affordability as this was not part of the Association's original request.

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Notes:

- Restrict your comments on the calculation of inflation to the above information. You may assume that household spending consists of only five categories: rent, food and beverages, work-related travel, clothing and entertainment/leisure.
- You may assume that the five spending categories shown in the table are the only categories on which Lalalanders spend money.
- Figures in the table are accurate.
- The projected annual inflation rate of 10.5% was calculated correctly based on the households who took part in the study.
- High income households tend to spend less on work-related travel than Association members or employees and are therefore relatively less influenced by very high inflation in this spending category.

[Total 50]

[Grand Total 100]

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END OF EXAMINATION