



Supporting Information

Supplementary methods

**This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.**

Appendix to: Mac OA, Muscat DM, Ayre J, et al. The readability of official public health information on COVID-19. *Med J Aust* 2021; doi: 10.5694/mja2.51282.

Coronavirus (COVID-19) vaccination information must pay attention to health literacy: analysis of readability of official COVID-19 public health information

Website Selection

We purposively selected websites from three countries (Australia, New Zealand, and the United Kingdom), three Australian states (New South Wales, Queensland, and Victoria), and three international Public Health Agencies (Centres for Disease Control and Prevention (CDC), European Centre for Disease Prevention and Control (ECDC), and World Health Organization (WHO)). We had a focus on resources from Australia, with other sources selected to provide global comparisons. The three Australian states were selected based on number total number of COVID-19 cases as of April 2021. We also identified easy-read resources which have been developed by some jurisdictions. Easy-read resources are generally translated from the main content into 'easy English', and often have a specified audience for people with disability, elderly, or people that speak English as a second language. Multi-media formats were excluded.

Readability

We used the health literacy editor 'Sydney Health Literacy Lab (SHeLL) Editor' to calculate readability.¹ The SHeLL editor is an online real-time editor that provides automated feedback on text complexity. It uses the Simple Measure of Gobbledygook (SMOG) Index² to calculate readability in the form of grade reading level. The SMOG index uses an algorithm based on the number of polysyllabic words (≥ 3 syllables) in each sentence. It is considered best suited for health applications as it has been validated against 100% comprehension; people with an eighth-grade reading ability would score 100% on a multiple-choice comprehension test for text written at an eighth grade reading level. It is, therefore, less likely to underestimate the grade reading level to compared to other readability formulas, such as the Flesch Kinkaid Grade Level, which assumes 75% comprehension³.

We copied and pasted text from each webpage separately into the SHeLL editor. Text was prepared following best practice guidelines from health literacy experts. Any part of the text that was not written as a complete sentence (e.g., bullet points and headings with less than four words) was excluded from the readability calculation to avoid underestimating the grade reading level. However, bullet points and headings that were written as full sentences or phrases were included. We removed any colons or full stops that did not indicate the end of a sentence (e.g., U.S. would be changed to US) and removed any URLs. We reported the proportion that exceeded an 8th grade reading level.

Understandability and Actionability

We used the validated Patient Education Materials Assessment Tool (PEMAT)⁴ developed by the Agency for Healthcare Research and Quality to assess the understandability and actionability of COVID-19 information. The understandability domain consists of 17 items under 6 topic areas (content, word choice and style, use of numbers, organisation, layout and design, and use of visual aids; Table 1) and measures the extent to which materials can be understood by consumers from diverse backgrounds and levels of health literacy. The actionability domain consists of 7 items and assesses how well consumers can use the information to take action. Each item is given a score of 0 (disagree) or 1 (agree), with some items having a not applicable (NA) option. Final scores are given as a percentage of all agree items for all items excluding those rated as not applicable. Higher scores indicate the material is easier to understand and act on, with scores of at least 70% considered adequate. Two evaluators with previous experience using the PEMAT scored the content independently, with any discrepancies resolved via discussion.

Table 1. Overview of the Patient Education Materials Assessment Tool (PEMAT) for printable materials

<p>Domain: Understandability</p> <p><i>Content</i></p> <ul style="list-style-type: none">Makes its purpose completely evidentDoes not include information that distracts from its purpose <p><i>Word choice and style</i></p> <ul style="list-style-type: none">The material uses common everyday languageMedical terms are defined and used only to familiarise readersThe material uses the active voice <p><i>Use of numbers</i></p> <ul style="list-style-type: none">Numbers are clear and easy to understandThe material does not expect the user to perform calculations <p><i>Organisation</i></p> <ul style="list-style-type: none">The material breaks or 'chunks' information into short sectionsThe material's sections have informative headersThe material presents information in a logical sequenceThe material provides a summary <p><i>Layout and design</i></p> <ul style="list-style-type: none">The material uses visual cues to draw attention to key points <p><i>Use of visual aids</i></p> <ul style="list-style-type: none">The material uses visual aids whenever they could make content more easily understoodThe material's visual aids have clear captions or titlesThe material uses illustrations and photographs are clear and unclutteredThe material uses simple tables with short and clear column and row headings <p>Domain: Actionability</p> <ul style="list-style-type: none">The material clearly identifies at least one action the user can takeThe material addresses the user directly when describing actionsThe material breaks down any actions into manageable, explicit stepsThe material provides a tangible tool whenever it could help the user take actionThe material provides simple instructions of how to perform calculationsThe material explains how to use charts, graphs, tables or diagrams to take actionThe material uses visual aids whenever they could make it easier to act on instructions

Analysis

For the PEMAT assessment, we grouped all webpages for each topic together. This was because one page often linked to another page with additional information, and for each source, material was presented in a similar style. We assessed the readability of each webpage separately however, as the actual written content varied across the pages, and we wanted to fully capture the range of readability scores. As the easy-read resources were designed to be viewed as a standalone resource, we assessed both the readability and PEMAT separately for each PDF. We conducted analyses exploring adjusting for clustering (by jurisdiction), which had no impact on the medians or interquartile ranges, therefore have just reported the raw values.

References

1. Ayre J, Muscat D, Bonner C, et al. Sydney Health Literacy Lab (SHLL) Health Literacy Editor. Sydney; 2021. <https://ses.library.usyd.edu.au/handle/2123/24642> (Viewed April 2021).
2. McLaughlin GH. SMOG grading: A new readability formula. *Journal of Reading*. 1969; 12: 639–646.
3. Wang LW, Miller MJ, Schmitt MR, et al. Assessing readability formula differences with written health information materials: Application, results, and recommendations. *Res Social Adm Pharm* 2013; 9:503–16.
4. Shoemaker SJ, Wolf MS, Brach C. Development of the Patient Education Materials Assessment Tool (PEMAT): A new measure of understandability and actionability for print and audiovisual patient information. *Patient Educ Couns* 2014; 96: 395–403.

Table 2. Title and URL of webpages accessed between 15 March and 9 April 2021

Information type, source and title	URL*
Australia (Federal Department of Health)	
<i>Standard content</i>	
Getting vaccinated for COVID-19	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19
When will I get a COVID-19 vaccine?	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/when-will-i-get-a-covid-19-vaccine
Learn about COVID-19 vaccines	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/learn-about-covid-19-vaccines
How will I get my COVID-19 vaccine?	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/how-will-i-get-my-covid-19-vaccine
Who can get vaccinated	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/covid-19-vaccination-program-for-people-aged-12-to-59
What should I do before I get vaccinated for COVID-19?	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/what-should-i-do-before-i-get-vaccinated-for-covid-19
Which COVID-19 vaccine will I receive?	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/which-covid-19-vaccine-will-i-receive
Information for Aboriginal and Torres Strait Islander peoples about COVID-19 vaccines	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-vaccinated-for-covid-19/covid-19-vaccines-indigenous
Information for people with disability about COVID-19 vaccines	https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/information-for-service-providers-workers-and-people-with-disability-about-covid-19-vaccines/information-for-people-with-disability-about-covid-19-vaccines
Physical distancing for coronavirus	https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/how-to-protect-yourself-and-others-from-coronavirus-covid-19/physical-distancing-for-coronavirus-covid-19
Masks	https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/how-to-protect-yourself-and-others-from-coronavirus-covid-19/masks
<i>Easy read content</i>	
COVID-19 vaccine overview**	
COVID-19 vaccination – What is the COVID-19 vaccine?	https://www.health.gov.au/resources/publications/covid-19-vaccination-what-is-the-covid-19-vaccine-easy-read
COVID-19 vaccination – Who will get the vaccine?	https://www.health.gov.au/resources/publications/covid-19-vaccination-who-will-get-the-vaccine-easy-read
COVID-19 vaccination – Where can you get the vaccine	https://www.health.gov.au/resources/publications/covid-19-vaccination-where-can-you-get-the-vaccine-easy-read
COVID-19 vaccination – The Pfizer vaccine	https://www.health.gov.au/resources/publications/covid-19-vaccination-the-pfizer-vaccine-easy-read
COVID-19 vaccination – Getting ready for the vaccine	https://www.health.gov.au/resources/publications/covid-19-vaccination-getting-ready-for-the-vaccination-easy-read
COVID-19 vaccination – What to expect when you have your vaccination	https://www.health.gov.au/resources/publications/covid-19-vaccination-what-to-expect-when-you-have-your-vaccination-easy-read
COVID-19 vaccination – Giving your consent	https://www.health.gov.au/resources/publications/covid-19-vaccination-giving-your-consent-easy-read
COVID-19 vaccination – Side effects you might have after your vaccination	https://www.health.gov.au/resources/publications/covid-19-vaccination-side-effects-you-might-have-after-your-vaccination-easy-read
COVID-19 vaccination – Other information	https://www.health.gov.au/resources/publications/covid-19-vaccination-other-information-easy-read
Coronavirus: Social distancing	https://www.health.gov.au/resources/publications/coronavirus-social-distancing-easy-read

Coronavirus: Wearing a mask	https://www.health.gov.au/resources/publications/coronavirus-wearing-a-mask-easy-read
New South Wales	
<i>Standard content</i>	
About the vaccine rollout	https://www.nsw.gov.au/covid-19/health-and-wellbeing/covid-19-vaccination-nsw/vaccine-rollout
Physical distancing	https://www.nsw.gov.au/covid-19/rules/changes/social-distancing
How wearing a face mask may help	https://www.nsw.gov.au/covid-19/health-and-wellbeing/face-masks/how-wearing-a-face-mask-may-help
Queensland	
<i>Standard content</i>	
About COVID-19 vaccines	https://www.qld.gov.au/health/conditions/health-alerts/coronavirus-covid-19/protect-yourself-others/covid-19-vaccine/about
How to protect yourself and others	https://www.qld.gov.au/health/conditions/health-alerts/coronavirus-covid-19/protect-yourself-others/coronavirus-prevention
Face masks – coronavirus	https://www.covid19.qld.gov.au/government-actions/how-you-can-help-keep-queensland-covid-safe
Victoria	
<i>Standard content</i>	
COVID-19 vaccines	https://www.coronavirus.vic.gov.au/vaccine
About COVID-19 vaccines	https://www.coronavirus.vic.gov.au/about-covid-19-vaccines
Book your vaccine appointment	https://www.coronavirus.vic.gov.au/vaccine
Who can get vaccinated against COVID-19	https://www.coronavirus.vic.gov.au/who-can-get-vaccinated
Hygiene and physical distancing	https://www.coronavirus.vic.gov.au/hygiene-physical-distancing
When to wear a face mask	https://www.coronavirus.vic.gov.au/face-masks-when-wear-face-mask
Importance of face masks	https://www.coronavirus.vic.gov.au/face-masks-importance-face-masks
Types of face masks	https://www.coronavirus.vic.gov.au/face-masks-types-face-masks
Face masks – working and volunteering**	
Face masks – shopping and retail**	
Face masks – study and school**	
Face masks – exercise**	
<i>Easy read content</i>	
How to keep you and your home safe from coronavirus***	https://www.coronavirus.vic.gov.au/information-people-disability-coronavirus-disease-covid-19
Who can get free face masks in Victoria?***	https://www.coronavirus.vic.gov.au/information-people-disability-coronavirus-disease-covid-19
Answers to your questions about face masks for people with disability***	https://www.coronavirus.vic.gov.au/information-people-disability-coronavirus-disease-covid-19
Do I have to wear a face mask?***	https://www.coronavirus.vic.gov.au/information-people-disability-coronavirus-disease-covid-19
New Zealand	
<i>Standard content</i>	
What to expect when you get your vaccination	https://covid19.govt.nz/covid-19-vaccines/how-to-get-a-covid-19-vaccination/
COVID-19 vaccine rollout groups	https://covid19.govt.nz/covid-19-vaccines/how-to-get-a-covid-19-vaccination/covid-19-vaccine-rollout-groups/
Vaccine development, safety and effectiveness	https://covid19.govt.nz/covid-19-vaccines/get-the-facts-about-covid-19-vaccination/how-covid-19-vaccines-are-developed-and-approved/
Maintain physical distancing	https://covid19.govt.nz/health-and-wellbeing/protect-yourself-and-others/maintain-physical-distancing/
Wear a face covering	https://covid19.govt.nz/health-and-wellbeing/protect-yourself-and-others-from-covid-19/wear-a-face-covering/

How to wear a face covering safely	https://covid19.govt.nz/health-and-wellbeing/protect-yourself-and-others-from-covid-19/wear-a-face-covering/how-to-wear-a-face-covering-safely/
How to make a face covering	https://covid19.govt.nz/health-and-wellbeing/protect-yourself-and-others-from-covid-19/wear-a-face-covering/how-to-make-a-face-covering/
<i>Easy read content</i>	
Getting your COVID-19 vaccine	https://covid19.govt.nz/iwi-and-communities/alternate-formats/easy-read/covid-19-vaccines-information-in-easy-read/#getting-your-covid-19-vaccine
Alert level 2 factsheet: leaving your home and going out	https://covid19.govt.nz/iwi-and-communities/alternate-formats/easy-read/information-about-the-alert-levels-in-easy-read/
What to do if you are exempt from wearing a face mask**	
When do you need to wear a face covering or face mask?***	https://covid19.govt.nz/iwi-and-communities/alternate-formats/easy-read/looking-after-your-community-information-in-easy-read/
United Kingdom	
<i>Standard content</i>	
Coronavirus vaccine	https://www.nhs.uk/conditions/coronavirus-covid-19/coronavirus-vaccination/coronavirus-vaccine/
Meeting with others safely (social distancing)	https://www.gov.uk/government/publications/coronavirus-covid-19-meeting-with-others-safely-social-distancing/coronavirus-covid-19-meeting-with-others-safely-social-distancing
Masks	https://www.gov.uk/government/publications/face-coverings-when-to-wear-one-and-how-to-make-your-own/face-coverings-when-to-wear-one-and-how-to-make-your-own
Centres for Disease Control and Prevention	
<i>Standard content</i>	
Key things to know about COVID-19 vaccines	https://www.cdc.gov/coronavirus/2019ncov/vaccines/keythingstoknow.html
Frequently asked questions about COVID-19 vaccines	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/faq.html
Myths and facts about COVID-19 vaccines	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html
What to expect at your appointment	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/expect.html
What to expect after getting a COVID-19 vaccine	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/expect/after.html
Benefits of getting a COVID-19 vaccine	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits.html
Understanding how vaccines work	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html
mRNA vaccines	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/mRNA.html
Information about the Pfizer vaccine	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/Pfizer-BioNTech.html
Understanding viral vector vaccines	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/viralvector.html
COVID-19 vaccines and allergic reactions	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/allergic-reaction.html
Safety of COVID-19 vaccines	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/safety-of-vaccines.html
How COVID-19 vaccines get to you	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/distributing.html
Vaccine considerations for people with disabilities	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/disabilities.html
Ensuring vaccines work	https://www.cdc.gov/coronavirus/2019ncov/vaccines/effectiveness.html
What older adults need to know about the COVID-19 vaccine	https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/older-adults.html

Social distancing	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html
Your guide to masks	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html
How to wear a mask	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-to-wear-cloth-face-coverings.html
How to store and wash masks**	
Guidance for wearing masks	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover-guidance.html
Improve how your mask protects you	https://www.cdc.gov/coronavirus/2019-ncov/your-health/effective-masks.html
Types of face masks	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/types-of-masks.html
Improve the fit and filtration of masks	https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/mask-fit-and-filtration.html
European Centre for Disease Prevention and Control	
<i>Standard content</i>	
COVID-19 vaccination	https://www.ecdc.europa.eu/en/covid-19/prevention-and-control/vaccines
How to protect yourself and others	https://www.ecdc.europa.eu/en/covid-19/prevention-and-control/protect-yourself
Questions and answers on COVID-19 prevention	https://www.ecdc.europa.eu/en/covid-19/questions-answers/questions-answers-prevention
World Health Organization	
<i>Standard content</i>	
Coronavirus disease (COVID-19): Vaccines	https://www.who.int/news-room/q-a-detail/coronavirus-disease-(covid-19)-vaccines
Advice for the public	https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public
Coronavirus disease (COVID-19): Masks	https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19-masks

* Content may have been updated since our assessments were conducted. **These pages have been updated and the URLs are no longer available. *** URL provided for the landing page for easy read resources where PDFs are available to be downloaded