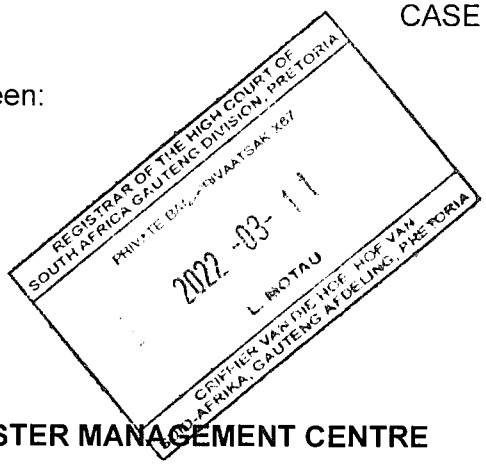
Original

IN THE HIGH COURT OF SOUTH AFRICA

GAUTENG DIVISION, PRETORIA

CASE NO.: 15232 /2022

In the application between:



SAKELIGA NPC Applicant

and

THE NATIONAL DISASTER MANAGEMENT CENTRE 1st Respondent

THE HEAD OF CENTRE: NATIONAL DISASTER MANAGEMENT CENTRE 2nd Respondent

THE MINISTER:COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS 3rd Respondent

THE MINISTER: HEALTH 4th Respondent

THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA 5th Respondent

THE NATIONAL CORONAVIRUS COMMAND COUNCIL 6th Respondent

THE NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES 7th Respondent

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NOTICE OF MOTION

BE PLEASED TO TAKE NOTICE THAT the applicant intends making application to the above Honourable Court, on a date and time to be arranged with the Registrar, for an order in the following terms:

1 THAT the first and second respondents' failure to decide and determine whether Covid-19 in the Republic of South Africa meets the definitional requirements of a 'disaster' in terms of the Disaster Management Act, Act 57 of 2002 (the "**DMA**"), and/alternatively to make recommendations on whether the declaration of the national state of disaster ought to be extended, as at the date of the third respondent's latest extension of the declaration of a national state of disaster in terms of section 27(5)(c) of the DMA (a copy of which is attached to the founding affidavit marked X2 - the "**February extension decision**"), be declared unlawful, and be reviewed and set aside.

2 In the alternative to the first prayer, THAT the first and second respondents' failure to reconsider its classification of Covid-19 in the Republic of South Africa as a 'disaster', alternatively a 'national disaster', as at the date of the February extension decision, be declared to be inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996, and accordingly invalid and set aside.

3 THAT it be declared that, as of the date of the February extension decision, Covid-19 in the Republic of South Africa does not meet the definition of 'disaster' in the DMA.

4 THAT it be declared that, as of the date of the February extension decision, Covid-19 in the Republic of South Africa does not meet the definition of 'national disaster' in the DMA.

5 THAT it be declared that, as of the date of the February extension decision, the objective facts required in terms of the DMA which are necessary to extend the declaration of the national state of disaster were not present.

6 THAT the first and second respondents be ordered and directed to furnish to the applicant all of the information in the possession of the first and second respondents regarding Covid-19 in the Republic of South Africa as classified by the first respondent and/alternatively by the second respondent in terms of section 23 of the DMA, including the assessment of the first respondent and/alternatively of the second respondent of the 'disaster' and the information recorded in the register referred to in section 23(1)(c) of the DMA, and all the information referred to in section 17 of the DMA of and concerning Covid-19 in the Republic of South Africa.

7 THAT the third respondent's February extension decision:

7.1 be declared to be inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996, and accordingly invalid and set aside.

7.2 be declared unlawful, irrational and unreasonable, and be reviewed and set aside.

8 In the alternative to the seventh prayer, THAT section 27(5)(c) of DMA be declared unconstitutional and invalid in that:

8.1 the section fails to provide adequate independent oversight over the National Executive and the third respondent;

8.2 the section purports to grant to the third respondent unfettered and unilateral power to extend the declaration of a 'national state of disaster' and to arrogate to herself the powers set out in section 27(2) of the DMA, and is accordingly inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996;

8.3 the section fails to adequately provide for the termination of a 'national state of disaster';

8.4 the section fails to adequately provide for the termination of any derogation of Constitutional rights and freedoms at the hands of the Executive under a 'national state of disaster';

8.5 the section constitutes an impermissible breach of the doctrine of the separation of powers, enables executive overreach, and is in breach of the rule of law, and accordingly inconsistent with the Constitution and invalid.

9 THAT in the alternative to all of the above, and should this Court find that any of the respondents' conduct and/or any portion of the DMA is inconsistent with the Constitution, but that the remedies sought by the applicant are for some reason not found to be appropriate, the applicant requests this Court to make an order that is just and equitable, as envisaged by section 172 of the Constitution, which has a remedial effect in the sense that it alleviates the Constitutional infringements and/or invalidities which the applicant raises in this application.

10 THAT the first, second and third respondents, jointly and severally, the one to pay the others to be absolved, be ordered and directed to pay the costs of the

application, which costs are to include the costs of two counsel, and, in the event that any further respondent/s oppose/s the application, that such respondent/s be directed to pay the aforesaid costs jointly and severally with the first, second and third respondents, the one to pay the other/s to be absolved.

11 **T**HAT the applicant be granted such further and/or alternative relief as the Court deems meet.

KINDLY TAKE FURTHER NOTICE that the first, second and third respondents are called upon, in terms of Rule 53(1)(a), to show cause why the aforementioned decisions that the applicant seeks to review should not be reviewed and set aside.

KINDLY TAKE FURTHER NOTICE that in terms of Rule 53(1)(b) the first, second and third respondents are requested to dispatch to the Registrar of this Honourable Court, within 15 (fifteen) days after the date of service of this notice of motion on the respondents, the record(s) of all documents relating to the making of the decisions sought to be reviewed, together with such reasons as the first, second and third respondents are by law required or that they desire to give or make.

TAKE FURTHER NOTICE that in terms of Rule 53(4) the applicant may within 10 (ten) days after receipt of the record(s) from the Registrar of this Honourable Court, by delivery of a notice and accompanying affidavit, amend, add to or vary the terms of the notice of motion and supplement the founding affidavit.

TAKE FURTHER NOTICE that the founding affidavits of **PIETER JACOBUS LE ROUX**, with attachments thereto, which is annexed to this notice of motion will be used in support of the relief sought herein.

BE PLEASED TO TAKE NOTICE that the applicant hereby appoints the address for service of all processes and documents in this application the address of **KRIEK WASSENAAR & VENTER INC, 13 STAMVRUG AVENUE, VAL DE GRACE, PRETORIA** (reference: **P WASSENAAR / QB0926**) as set out hereunder.

TAKE FURTHER NOTICE that if you intend to oppose this application you are required to:

(a) Within 15 (FIFTEEN) days after date of receipt of this notice of motion or any amendment thereof as contemplated in Rule 53(4), to deliver a notice to the applicant stating that you intend to oppose this application, and in such notice, appoint an address within 15km of the office of the Registrar of this Honourable Court; and

(b) Within 30 (THIRTY) days after expiry of the time period referred to in Rule 53(4), deliver such answering affidavit(s) or other affidavit(s) together with any relevant documents as you may desire in answer to the allegations made by the applicant in the founding affidavit or any amendment or supplementation thereof.

KINDLY TAKE FURTHER NOTICE that if you fail to notify the attorney for the applicant of your intention to oppose the application within 15 (FIFTEEN) days after date of receipt of this notice of motion and/or if you fail to serve and file an answering affidavit within 30 (THIRTY) days after expiry of the time period referred to in Rule 53(4), this application will be set down on the unopposed motion roll on a date to be arranged with the Registrar.

DATED AT PRETORIA ON 11 MARCH 2022.

KRIEK WASSENAAR & VENTER INC
ATTORNEYS FOR THE DEFENDANT
3rd Floor, HB Forum Building
13 Stamvrug Street, Val de Grace
Pretoria
Tel: 012 803 4719/756 7566
Fax: 086 596 8516
E-mail: peter@kriekprok.co.za
CaseLines: info@kriekprok.co.za
Ref: **P WASSENAAR / QB0926**

TO: **THE REGISTRAR OF THE HIGH COURT**
PRETORIA

AND TO: **THE NATIONAL DISASTER MANAGEMENT CENTRE**

FIRST RESPONDENT

Riverside Office Park
Letaba Building
2nd Floor, 1303 Heuwel Avenue
Centurion
Gauteng, 0157

SERVICE BY SHERIFF

AND TO: **THE HEAD OF CENTRE :**

NATIONAL DISASTER MANAGEMENT CENTRE

SECOND RESPONDENT
Riverside Office Park
Letaba Building
2nd Floor, 1303 Heuwel Avenue

Centurion
Gauteng, 0157

SERVICE BY SHERIFF

AND TO: **THE MINISTER :**
COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS
THIRD RESPONDENT
87 Hamilton Street
Arcadia
Pretoria
Gauteng

SERVICE BY SHERIFF

AND TO: **THE MINISTER: HEALTH**
FOURTH RESPONDENT
Dr AB Xuma Building
1112 Voortrekker Rd
Pretoria Townlands 351-JR
Pretoria
Gauteng, 0187

SERVICE BY SHERIFF

AND TO: **THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA**
FIFTH RESPONDENT
Union Buildings
Government Avenue
Pretoria
Gauteng Province

SERVICE BY SHERIFF

AND TO: **THE NATIONAL CORONAVIRUS COMMAND COUNCIL**
SIXTH RESPONDENT
c/o State Attorney, Pretoria
316 Thabo Sehume Street
Pretoria Central
Pretoria
Gauteng, 0001

SERVICE BY SHERIFF

AND TO: **THE NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES**
SEVENTH RESPONDENT
1 Modderfontein Road
Sandringham
Johannesburg
2192.

SERVICE BY SHERIFF

AND TO: **THE STATE ATTORNEY PRETORIA**
316 Thabo Sehume Street
Pretoria Central
Pretoria, 0001

SERVICE BY HAND ON _____2022

_____

IN THE HIGH COURT OF SOUTH AFRICA

GAUTENG DIVISION, PRETORIA

CASE NO.: _____/2022

In the application between:

SAKELIGA NPC	Applicant
and	
THE NATIONAL DISASTER MANAGEMENT CENTRE	1st Respondent
THE HEAD OF THE NATIONAL DISASTER MANAGEMENT CENTRE	2nd Respondent
THE MINISTER: COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS	3rd Respondent
THE MINISTER: HEALTH	4th Respondent
THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA	5th Respondent
THE NATIONAL CORONAVIRUS COMMAND COUNCIL	6th Respondent
THE NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES	7th Respondent

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FOUNDING AFFIDAVIT

Contents

DEPONENT

I, the undersigned,

PIETER JACOBUS LE ROUX

do hereby state under oath as follows:

1 I am an adult male and the chief executive officer of Sakeliga NPC, the applicant, which has its offices at Building A, 5th Floor, Loftus Park, 402 Kirkness Street, Arcadia, Pretoria, Gauteng Province.

2 The facts set out herein fall within my personal knowledge, save where the contrary is expressly stated or appears from the context, and such facts are true and correct.

3 To the extent that any facts set out herein do not fall within my personal knowledge, I shall attempt to obtain confirmatory affidavits from persons with such personal knowledge. To the extent that I am unable to confirm such facts by means of confirmatory affidavits, I request the Court to admit such facts as evidence in terms of section 3 of the Law of Evidence Amendment Act, Act 45 of 1988.

4 Where I make legal submissions herein, I do so based on the advice that I have received from the legal representatives of the applicant.

5 The applicant has appointed Kriek Wassenaar & Venter Inc ("**KWV**") as its attorney of record. KWV has instructions to institute and prosecute this application.

THE APPLICANT

6 The applicant is **SAKELIGA NPC**, a non-profit company duly registered and incorporated in terms of the statutes of the Republic of South Africa, with registration number 2012/043725/08, and with its principal place of business at Building A, 5th Floor, Loftus Park, 402 Kirkness Street, Arcadia, Pretoria, Gauteng Province.

7 The applicant is a business-interest organisation with a support and donor base of more than 12 000 businesspeople, companies and business organisations, and a network of more than 40 000 subscribers in South Africa supporting its causes and objectives.

8 The applicant was established in the year 2011 and was incorporated and registered as a non-profit company in terms of the Companies Act, Act 71 of 2008, in the year 2012. The applicant's main objective is the protection of constitutional rights, constitutional order, the rule of law, free-market principles and a just and sustainable business environment within the Republic of South Africa.

9 Pursuant to its objectives, the applicant lobbies to promote a free market and economic prosperity and to create a favourable business environment in the interest of its supporters and in the interest of the common good. Further, to achieve the applicant's objectives and perform its functions and mandate, the applicant is *inter alia* mandated to act in the interest of its supporters and members of the public to protect their business and other constitutional rights.

10 The aforesaid is also evident from and confirmed by an extract of the applicant's memorandum of incorporation, which I attach hereto marked **X1**. I draw the Court's attention specifically to clause 4 of the memorandum of incorporation, which I confirm, which sets out in more detail the objects, ancillary objects, as well as the powers of the applicant.

11 I do not attach a full copy of the memorandum of incorporation to these papers because it will make these papers unnecessarily prolix and voluminous. The applicant will make its full memorandum of incorporation available to the Court and to any of the respondents who request it.

THE RESPONDENTS

12 The first respondent is **THE NATIONAL DISASTER MANAGEMENT CENTRE**, an institution within the public service established in terms of section 8(1) of the Disaster Management Act, Act 57 of 2002 (the "**DMA**"). The first respondent is responsible for managing and coordinating national disasters in accordance with the DMA. The main place of business of the first respondent is situated at Riverside Office Park, Letaba House, 2nd Floor, 1303 Heuwel Avenue, Centurion, Gauteng. I shall refer to the first respondent hereinafter as the "**National Centre**".

13 The second respondent is **THE HEAD OF THE NATIONAL CENTRE**, appointed as such in terms of section 10 of the DMA, a public office currently held by Dr Mmaphaka Ephraim Tau. Dr Tau also acts as the deputy-director general of the National Department of Cooperative Governance and Traditional Affairs, with offices at Riverside Office Park, Letaba Building, 2nd Floor, 1303 Heuwel

Avenue, Centurion, Gauteng, 0157. I shall refer to the second respondent hereinafter as the "**Head of the National Centre**".

14 The third respondent is the **MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS**, cited herein in her official capacity. Dr. Nkosazana Clarice Dlamini-Zuma currently holds the aforesaid public office, is the member of cabinet responsible for cooperative governance, and is responsible for the managing of the declared 'national state of disaster' under the DMA. The third respondent has her office situated at 87 Hamilton Street, Arcadia, Pretoria, Gauteng. I shall refer to the third respondent hereinafter as the "**Minister**".

15 The fourth respondent is the **MINISTER OF HEALTH**, cited herein in his official capacity. Dr Joe Phaahla currently holds the aforesaid public office, and he is the member of cabinet responsible for providing a framework for a structured and uniform health system for South Africa. The fourth respondent has his office situated at Dr AB Xuma Building, 1112 Voortrekker Rd, Pretoria Townlands 351-JR, Pretoria, Gauteng, 0187. I shall refer to the fourth respondent hereinafter as the "**Minister of Health**".

16 The fifth respondent is the **PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA**, cited herein in his official capacity. Mr Matamela Cyril Ramaphosa currently holds the aforesaid public office. The fifth respondent is the head of the national Executive and Cabinet. He is cited in these proceedings by virtue of the fact that section 85(1) of the Constitution vests the executive authority of the Republic in the President of the Republic. The fifth respondent has his office

situated at the Union Buildings, Government Avenue, Pretoria, Gauteng. I shall refer to the fifth respondent hereinafter as the "**President**".

17 The sixth respondent is the **NATIONAL CORONAVIRUS COMMAND COUNCIL**, a committee within Cabinet, established by the President to take policy decisions regarding the government's response to Covid-19. The sixth respondent is served in care of the State Attorney, Pretoria at 316 Thabo Sehume Street, Pretoria Central, Pretoria, Gauteng, 0001. I shall refer to the sixth respondent hereinafter as the "**NCCC**".

18 The seventh respondent is the **NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES**. The seventh respondent is a national public health institute and an institution within the public service whose aim is to support the government's response to communicable diseases. The main place of business of the seventh respondent is situated at 1 Modderfontein Road, Sandringham, Johannesburg, 2192. The seventh respondent is cited in these proceedings to the extent that it has an interest herein. I shall refer to the seventh respondent hereinafter as the "**NICD**". The NICD also coordinates the functions of the South African Covid-19 Modelling Consortium (hereinafter referred to as the "**SACMC**"), being a group of researchers from academic, non-profit and government institutions across South Africa with the mandate of providing projection models regarding Covid-19 to be used for planning purposes by the NICD and the government of South Africa.

19 A copy of this application will also be served in respect of the third, fourth, fifth, and sixth respondents, on the office of the **State Attorney**, Pretoria at 316 Thabo Sehume Street, Pretoria Central, Pretoria, 0001.

20 The fourth to seventh respondents are cited herein for the interest that they may have in this application. No cost order is sought against the fourth to seventh respondents at this stage. A cost order will only be sought in the event of such respondent/s opposing this application.

LOCUS STANDI

21 The applicant has *locus standi* to bring this application:

21.1 in its own interest as a party (as contemplated in section 38(a) of the Constitution) directly affected by the ‘national state of disaster’ declared under the DMA and the continued extension thereof by the Minister;

21.2 in the general public interest (as contemplated in section 38(d) of the Constitution); and

21.3 in the interest of its members and supporters (as contemplated in section 38(e) of the Constitution) who are also directly affected by the ‘national state of disaster’ declared under the DMA and the continued extension thereof by the Minister.

22 Further argument insofar as may be necessary shall be advanced at the hearing of the application, and with reference to the facts set out in the body of this affidavit in support of the locus standi of the applicant.

JURISDICTION

23 This Court has jurisdiction to adjudicate this application by virtue of the respondents' principal places of business and administration being situated within the Court's area of territorial jurisdiction.

RELIEF SOUGHT BY APPLICANT

24 The applicant is aggrieved by the continued, arbitrary, capricious and unvetted extension of the declaration of the ‘national state of disaster’ by the Minister in terms of section 27(5)(c) of the DMA.

25 The applicant will show that Covid-19 at the time of the last extension of the declaration of a national state of disaster by the Minister on 14 February 2022, did not constitute an objective statutory 'disaster' as envisaged by section 1 of the DMA.

26 Furthermore, the applicant intends to show that as at 14 February 2022, the Covid-19 outbreak could not be objectively classified as a 'national disaster' by the National Centre and the Head of the National Centre in terms of section 23 of the DMA, and that accordingly the Minister would not legally and objectively be entitled to extend the 'national state of disaster' in terms of section 27(5)(c) of the DMA.

27 In terms of the applicant's notice of motion, the following relief is sought:

27.1 THAT the first and second respondents' failure to decide and determine whether Covid-19 in the Republic of South Africa meets the definitional requirements of a 'disaster' in terms of the DMA, and/alternatively to make recommendations on whether the declaration of the national state of disaster ought to be extended, as at the date of the third respondent's latest extension of the declaration of a national state of disaster in terms of section 27(5)(c) of the DMA (a copy of which is attached to the founding

affidavit marked **X2** - the "**February extension decision**"), be declared unlawful, and be reviewed and set aside.

27.2 In the alternative to the first prayer, THAT the first and second respondents' failure to reconsider its classification of Covid-19 in the Republic of South Africa as a 'disaster', alternatively a 'national disaster', as at the date of the February extension decision, be declared to be inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996, and accordingly invalid and set aside.

27.3 THAT it be declared that, as of the date of the February extension decision, Covid-19 in the Republic of South Africa does not meet the definition of 'disaster' in the DMA.

27.4 THAT it be declared that, as of the date of the February extension decision, Covid-19 in the Republic of South Africa does not meet the definition of 'national disaster' in the DMA.

27.5 THAT it be declared that, as of the date of the February extension decision, the objective facts required in terms of the DMA which are necessary to extend the declaration of the national state of disaster were not present.

27.6 THAT the first and second respondents be ordered and directed to furnish to the applicant all of the information in the possession of the first and second respondents regarding Covid-19 in the Republic of South Africa as classified by the first respondent and/alternatively by the second

respondent in terms of section 23 of the DMA, including the assessment of the first respondent and/alternatively of the second respondent of the 'disaster' and the information recorded in the register referred to in section 23(1)(c) of the DMA, and all the information referred to in section 17 of the DMA of and concerning Covid-19 in the Republic of South Africa.

27.7 THAT the third respondent's February extension decision:

27.7.1 be declared to be inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996, and accordingly invalid and set aside.

27.7.2 be declared unlawful, irrational and unreasonable, and be reviewed and set aside.

27.8 In the alternative to the seventh prayer, THAT section 27(5)(c) of DMA be declared unconstitutional and invalid in that:

27.8.1 the section fails to provide adequate independent oversight over the national Executive and the third respondent;

27.8.2 the section purports to grant to the third respondent unfettered and unilateral power to extend the declaration of a ‘national state of disaster’ and to arrogate to herself the powers set out in section 27(2) of the DMA, and is accordingly inconsistent with sections 1, 2, 7, 8, 10, 12, 33, and 36 of the Constitution of the Republic of South Africa, 1996;

27.8.3 the section fails to adequately provide for the termination of a ‘national state of disaster’;

27.8.4 the section fails to adequately provide for the termination of any derogation of Constitutional rights and freedoms at the hands of the Executive under a ‘national state of disaster’;

27.8.5 the section constitutes an impermissible breach of the doctrine of the separation of powers, enables executive overreach, and is in breach of the rule of law, and accordingly inconsistent with the Constitution and invalid.

27.9 THAT in the alternative to all of the above, and should this Court find that any of the respondents' conduct and/or any portion of the DMA is inconsistent with the Constitution, but that the remedies sought by the applicant are for some reason not found to be appropriate, the applicant requests this Court to make an order that is just and equitable, as envisaged by section 172 of the Constitution, which has a remedial effect in the sense that it alleviates the Constitutional infringements and/or invalidities which the applicant raises in this application.

27.10 THAT the first, second and third respondents, jointly and severally, the one to pay the others to be absolved, be ordered and directed to pay the costs of the application, which costs are to include the costs of two counsel, and, in the event that any further respondent/s oppose/s the application, that such respondent/s be directed to pay the aforesaid costs jointly and severally with the first, second and third respondents, the one to pay the other/s to be absolved.

27.11 THAT the applicant be granted such further and/or alternative relief as the Court deems meet.

DISASTER MANAGEMENT AND PUBLIC HEALTH

28 The applicant will present argument on the proper interpretation of the DMA to show that it is aimed at specific resource management during an objectively classified statutory ‘disaster’ and not general public health management concerns as a consequence of an adverse public health event.

29 The DMA does not provide general long-term mechanisms to manage public health risks.

30 No matter how calamitous or severe the consequences are, not all public health risks and adverse events qualify as statutory ‘disasters’ under the DMA. This does not imply that government does not have a duty to address adverse events. It does. Extraordinary emergency powers under the DMA might not necessarily always be available (or appropriate) for government to use in order to respond to such events.

31 The Minister must prove that an actual statutory ‘disaster’ exists before she may access emergency powers under the DMA, or proceed to extend her ability to access such powers.

WHAT THIS CASE IS NOT ABOUT

32 The applicant does not deny that the Covid-19 outbreak was a serious adverse event that affected the health and lives of millions of people worldwide. The applicant does not seek to question the existence of Covid-19, nor does it deny

that the outbreak had resulted in many thousands of people dying as a result of severe Covid-19 disease.

33 It is the applicant's intention with this application to ensure that the extraordinary rights afforded to the Minister by section 27(2) of the DMA, only be available to government during an objective statutory 'disaster', and that such powers always be subject to proper constitutional restraints, in order to ensure that any derogation of constitutional rights and freedoms be checked, and that such rights and freedoms be returned to the public as soon as possible.

34 The application seeks to protect the constitutional rights and freedoms of the public.

THE DISASTER MANAGEMENT ACT

35 The preamble of the DMA provides that the Act is to provide for:

- *An integrated and co-ordinated disaster management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery and rehabilitation;*
- *the establishment and functioning of national, provincial and municipal disaster management centres;*
- *disaster management volunteers; and*
- *matters incidental thereto."*

36 Despite the title of the DMA, it is apparent from its stated purpose that the DMA focuses largely on disaster risk reduction. The DMA is not a general public health

management tool but rather legislation aimed at disaster management with a specific focus on resource management during a disaster.

37 The DMA defines a disaster as:

> *"**disaster**' means a progressive or sudden, widespread or localised, natural or human-caused occurrence which-*
>
> *(a) causes or threatens to cause-*
>
> *(i) death, injury or disease;*
>
> *(ii) damage to property, infrastructure or the environment; or*
>
> *(iii) significant disruption of the life of a community; and*
>
> *(b) is of a magnitude that exceeds the ability of those affected by the disaster to cope with its effects using only their own resources;"*

38 The DMA defines a statutory functionary as: "*'**statutory functionary**' means a person performing a function assigned to that person by national, provincial or municipal legislation;"*. The DMA includes any regulations made in terms of section 59 of the DMA.

39 Section 2 of the DMA provides that the Act does not apply in the following circumstances:

> *"Application of Act*
>
> *(1) This Act does not apply to an occurrence falling within the definition of 'disaster' in section 1-*
>
> *(a) if, and from the date on which, a state of emergency is declared to deal with that occurrence in terms of the State of Emergency Act, 1997 (Act 64 of 1997); or*
>
> *(b) to the extent that that occurrence can be dealt with effectively in terms of other national legislation-*

(i) aimed at reducing the risk, and addressing the consequences, of occurrences of that nature; and

(ii) identified by the Minister by notice in the Gazette."

40 The DMA is administered by the Minister, being the Cabinet member designated by the President. (DMA, section 3)

41 In terms of section 6 of the DMA, the Minister must prescribe a national disaster management framework (by notice in the Gazette).

42 Section 7 of the DMA prescribes the content of the national disaster management framework. It must be *inter alia* "*… a coherent, transparent and inclusive policy on disaster management appropriate for the Republic as a whole.*"

43 Section 8 of the DMA establishes the National Centre: "*A National Disaster Management Centre is established as an institution within the public service.*" The National Centre is established within the public service, accordingly imposing various constitutional duties and obligations upon the National Centre.

44 The objective of the National Centre is to promote an integrated and coordinated system of disaster management, with particular emphasis on prevention and mitigation, by national, provincial and municipal organs of state, statutory functionaries, other role-players involved in disaster management and communities. (DMA, section 9)

45 The Minister must appoint the Head of the National Centre who reports to the Minister. (DMA, section 10)

46 Section 12 of the DMA provides for the responsibilities of the Head of the National Centre as follows:

"*(1) The Head of the National Centre-*

(a) is responsible for the exercise by the National Centre of its powers and the performance of its duties; and

(b) takes all decisions of the National Centre in the exercise of its powers and the performance of its duties, except decisions of the National Centre taken in consequence of a delegation or assignment in terms of section 14.

(2) The Head of the National Centre performs the functions of office subject to section 15 (3)."

47 Section 15 of the DMA provides for the general powers and duties of the National Centre. It provides as follows:

"*15 General powers and duties*

(1) The National Centre must, subject to other provisions of this Act, do all that is necessary to achieve its objective as set out in section 9, and, for this purpose-

(a) must specialise in issues concerning disasters and disaster management;

(b) must monitor whether organs of state and statutory functionaries comply with this Act and the national disaster management framework and must monitor progress with post-disaster recovery and rehabilitation;

(c) must act as a repository of, and conduit for, information concerning disasters, impending disasters and disaster management;

(d) may act as an advisory and consultative body on issues concerning disasters and disaster management to-

(i) organs of state and statutory functionaries;

(ii) the private sector and non-governmental organisations;

(iii) communities and individuals; and

(iv) other governments and institutions in southern Africa;

(e) must make recommendations regarding the funding of disaster management and initiate and facilitate efforts to make such funding available;

(f) must make recommendations to any relevant organ of state or statutory functionary-

(i) on draft legislation affecting this Act, the national disaster management framework or any other disaster management issue;

(ii) on the alignment of national, provincial or municipal legislation with this Act and the national disaster management framework; or

(iii) in the event of a national disaster, on whether a national state of disaster should be declared in terms of section 27;

(g) must promote the recruitment, training and participation of volunteers in disaster management;

(h) must promote disaster management capacity building, training and education throughout the Republic, including in schools, and, to the extent that it may be appropriate, in other southern African states;

(i) must promote research into all aspects of disaster management;

(j) may assist in the implementation of legislation referred to in section 2 (1) (b) to the extent required by the administrator of such legislation and approved by the Minister; and

(k) may exercise any other powers conferred on it, and must perform any other duties assigned to it in terms of this Act.

(2) The National Centre may-

(a) engage in any lawful activity, whether alone or together with any other organisation in the Republic or elsewhere, aimed at promoting the effective exercise of its powers or the effective performance of its duties;

(aA) in any event of a disaster, or a potential disaster, call on the South African National Defence Force, South African Police Service and any other organ of state to assist the disaster management structures;

[Para. (aA) inserted by s. 7 (a) of Act 16 of 2015 (wef 1 May 2016).]

(b) exchange information relevant to disaster management with institutions performing functions similar to those of the National Centre in the Republic and elsewhere.

(3) The National Centre must exercise its powers and perform its duties-

(a) within the national disaster management framework;

(b) subject to the directions of the Minister; and

(c) .....

[Para. (c) deleted by s. 7 (b) of Act 16 of 2015 (wef 1 May 2016).]

(d) subject to the Public Finance Management Act, 1999 (Act 1 of 1999).

(4) The National Centre must liaise and co-ordinate its activities with the provincial and municipal disaster management centres."

48 Section 17 of the DMA provides for a disaster management information system. Section 17(1) provides that:

"*(1) The National Centre must act as a repository of, and conduit for, information concerning disasters and disaster management, and, must for this purpose-*

(a) collect information on all aspects of disasters and disaster management;

(b) process and analyse such information;

(c) develop and maintain an electronic database envisaged in subsection (2); and

(d) take steps to disseminate such information, especially to communities that are vulnerable to disasters."

49 In terms of section 17(2): "*The electronic database developed by the National Centre must contain extensive information concerning disasters that occur or may occur in southern Africa and disaster management issues, including information on…*" *inter alia* "*… each disaster classified by the National Centre in terms of section 23, including the assessment of the National Centre of the disaster and the information recorded in the register referred to in subsection (1) (c) of that section…*".

50 The National Centre must take reasonable steps to ensure that the database is electronically accessible to any person free of charge.

51 Section 23 of the DMA gives the National Centre the power and duty to classify a 'disaster' after assessing it. The importance of this section and the ongoing assessment by the National Centre is highlighted by the words used in this section, namely that the assessment must be done: "*… for the purpose of the proper application of this Act…*". Absent the assessments envisaged herein in terms of the DMA, the DMA cannot be properly applied. The section reads:

"*23 Classification and recording of disasters*

(1) When a disastrous event occurs or threatens to occur, the National Centre must, for the purpose of the proper application of this Act, determine whether the event should be regarded as a disaster in terms of this Act, and if so, the National Centre must immediately-

(a) assess the magnitude and severity or potential magnitude and severity of the disaster;

(b) classify the disaster as a local, provincial or national disaster in accordance with subsections (4), (5) and (6);

(bA) inform the relevant provincial disaster management centre of the decision on the classification of the disaster made in terms of paragraph (b); and

[Para. (bA) inserted by s. 9 (a) of Act 16 of 2015 (wef 1 May 2016).]

(c) record the prescribed particulars concerning the disaster in the prescribed register.

(2) When assessing the magnitude and severity or potential magnitude and severity of a disaster, the National Centre-

(a) must consider any information and recommendations concerning the disaster received from a provincial or municipal disaster management centre in terms of section 35 or 49; and

(b) may enlist the assistance of an independent assessor to evaluate the disaster on site.

(3) The National Centre may reclassify a disaster classified in terms of subsection (1) (b) as a local, provincial or national disaster at any time after consultation with the relevant provincial or municipal disaster management centres, if the magnitude and

severity or potential magnitude and severity of the disaster is greater or lesser than the initial assessment.

(4) A disaster is a local disaster if-

(a) it affects a single metropolitan, district or local municipality only; and

(b) the municipality concerned, or, if it is a district or local municipality, that municipality either alone or with the assistance of local municipalities in the area of the district municipality is able to deal with it effectively.

(5) A disaster is a provincial disaster if-

(a) it affects-

(i) more than one metropolitan or district municipality in the same province; or

(ii) a single metropolitan or district municipality in the province and that metropolitan municipality, or that district municipality with the assistance of the local municipalities within its area, is unable to deal with it effectively; and

[Para. (a) substituted by s. 9 (b) of Act 16 of 2015 (wef 1 May 2016).]

(b) the province concerned is able to deal with it effectively.

(6) A disaster is a national disaster if it affects-

(a) more than one province; or

(b) a single province which is unable to deal with it effectively.

(7) Until a disaster is classified in terms of this section, the disaster must be regarded as a local disaster.

(8) The classification of a disaster in terms of this section designates primary responsibility to a particular sphere of government for the co-ordination and management of the disaster, but an organ of state in another sphere may assist the sphere having primary responsibility to deal with the disaster and its consequences."

52 The declaration of a 'national state of disaster' and the extension of such declaration is dealt with in section 27 of the DMA which provides as follows:

"*27 Declaration of national state of disaster*

(1) In the event of a national disaster, the Minister may, by notice in the Gazette, declare a national state of disaster if-

(a) existing legislation and contingency arrangements do not adequately provide for the national Executive to deal effectively with the disaster; or

(b) other special circumstances warrant the declaration of a national state of disaster.

(2) If a national state of disaster has been declared in terms of subsection (1), the Minister may, subject to subsection (3), and after consulting the responsible Cabinet member, make regulations or issue directions or authorise the issue of directions concerning-

(a) the release of any available resources of the national government, including stores, equipment, vehicles and facilities;

(b) the release of personnel of a national organ of state for the rendering of emergency services;

(c) the implementation of all or any of the provisions of a national disaster management plan that are applicable in the circumstances;

(d) the evacuation to temporary shelters of all or part of the population from the disaster-stricken or threatened area if such action is necessary for the preservation of life;

(e) the regulation of traffic to, from or within the disaster-stricken or threatened area;

(f) the regulation of the movement of persons and goods to, from or within the disaster-stricken or threatened area;

(g) the control and occupancy of premises in the disaster-stricken or threatened area;

(h) the provision, control or use of temporary emergency accommodation;

(i) the suspension or limiting of the sale, dispensing or transportation of alcoholic beverages in the disaster-stricken or threatened area;

(j) the maintenance or installation of temporary lines of communication to, from or within the disaster area;

(k) the dissemination of information required for dealing with the disaster;

(l) emergency procurement procedures;

(m) the facilitation of response and post-disaster recovery and rehabilitation;

(n) other steps that may be necessary to prevent an escalation of the disaster, or to alleviate, contain and minimise the effects of the disaster; or

(o) steps to facilitate international assistance.

(3) The powers referred to in subsection (2) may be exercised only to the extent that this is necessary for the purpose of-

(a) assisting and protecting the public;

(b) providing relief to the public;

(c) protecting property;

(d) preventing or combating disruption; or

(e) dealing with the destructive and other effects of the disaster.

(4) Regulations made in terms of subsection (2) may include regulations prescribing penalties for any contravention of the regulations.

(5) A national state of disaster that has been declared in terms of subsection (1)-

(a) lapses three months after it has been declared;

(b) may be terminated by the Minister by notice in the Gazette before it lapses in terms of paragraph (a); and

(c) may be extended by the Minister by notice in the Gazette for one month at a time before it lapses in terms of paragraph (a) or the existing extension is due to expire."

53 Section 26 of the DMA provides that in the event of a national disaster, the national Executive is primarily responsible for the co-ordination and management of such (national) disasters. Section 26 provides as follows:

"*26 Responsibilities in event of national disaster*

(1) The national Executive is primarily responsible for the co-ordination and management of national disasters irrespective of whether a national state of disaster has been declared in terms of section 27.

(2) The national Executive must deal with a national disaster-

(a) in terms of existing legislation and contingency arrangements, if a national state of disaster has not been declared in terms of section 27 (1); or

(b) in terms of existing legislation and contingency arrangements as augmented by regulations or directions

made or issued in terms of section 27 (2), if a national state of disaster has been declared.

(3) This section does not preclude a provincial or municipal organ of state from providing assistance to the national Executive to deal with a national disaster and its consequences, and the national Executive, in exercising its primary responsibility, must act in close co-operation with the other spheres of government."

EXTENSION OF A NATIONAL STATE OF DISASTER

54 The power of extension of the 'national state of disaster' in terms of section 27(5)(c) of the DMA is subject to the same requirements as the original declaration of the 'national state of disaster' in terms of section 27(1) of the DMA. In the absence of such requirements, being preconditions or jurisdictional facts, the Minister has no power to extend the declaration at all.

55 These requirements, applied to the power to extend a declaration of a 'national state of disaster', are as follows:

55.1 As at the date of the decision to extend a declaration of a 'national state of disaster', there must be a 'disaster' as defined in the DMA.

55.2 The National Centre must confirm that the occurrence continues to constitute a 'disaster' and that such 'disaster' is a 'national disaster' before the Minister may extend the 'national state of disaster'.

55.3 The Minister may only extend the 'national state of disaster' if at the date of the decision to extend the 'national state of disaster'-

55.3.1 existing legislation and contingency arrangements do not adequately provide for the national Executive to deal effectively with the ‘disaster’; or

55.3.2 other special circumstances warrant the extension of the declaration of a ‘national state of disaster’.

56 Each of the above requirements must be met. Each of these requirements are objective requirements. These objective requirements must be present before the Minister extends the declaration of a ‘national state of disaster’. Failing this, the Minister acts unlawfully, outside of the empowering legislation, and contrary to the rule of law.

57 In addition, absent the objective jurisdictional requirements for an extension being met, an extension by the Minister of the declaration of a ‘national state of disaster’ constitutes an unlawful and unconstitutional arrogation of legislative powers by the Minister, which is fundamentally at odds with and in breach of the doctrine of separation of powers and the rule of law.

58 A ‘national disaster’ should only be declared under extraordinary circumstances. The reasons for the declaration of a ‘disaster’ should include facilitating quick response to emergencies, the speedy release of state funds and the rapid deployment of resources. The same applies to the extension of a declaration of a ‘national state of disaster’.

59 In determining whether to extend a ‘national state of disaster’, it is relevant that the DMA itself contemplates that the declaration is to endure for a limited period only. The DMA provides that a national state of disaster that has been declared

lapses three months after it has been declared (section 27(5)(a)), and that such declaration of a 'national state of disaster' may be extended for only one month at a time before it lapses (section 27(5)(a)). As a remedy for extraordinary circumstances, it is submitted that such declaration and any extension is to be of short duration.

60 The objective facts demonstrate that the requirements above have not been met. The Minister has acted outside of the law in extending the declaration of a 'national state of disaster', and for a purpose not justified by the DMA. The Minister has acted unlawfully, irrationally, unreasonably, and outside of the parameters of the DMA in extending the declaration. The Minister has failed to have regard to relevant facts, and has taken account of irrelevant facts. No reasonable decisionmaker in the position of the Minister would have arrived at the conclusion that the Minister arrived at. The Minister has further not followed the required procedure as is required by the empowering legislation.

61 In the alternative, and should the Court find that section 27(5)(c) of the DMA empowers the Minister to extend the national state of disaster in the absence of the objective requirements that I have set out above, then in such circumstances, I state that the aforesaid sub-section of the DMA is unconstitutional (an aspect that I shall deal with in greater detail later in this affidavit).

COVID-19 DISASTER MANAGEMENT

62 On 15 March 2020, the National Centre and the Head of the National Centre published their classification of Covid-19 as a 'national disaster' in terms of section 23 of the DMA. A copy of the notice as published in the Government Gazette is attached hereto marked **X3**.

63 On the very same day, 15 March 2020, the Minister proceeded, in terms of section 27(1) of the DMA, to declare a 'national state of disaster'. To date of this affidavit, the Minister has extended her declaration of a 'national state of disaster' for just shy of 24 months. A copy of the Minister's declaration is attached hereto marked **X4**.

64 On 14 February 2022, the Minister once again extended the 'national state of disaster' until 15 March 2022 (I refer to the February extension decision marked annexure **X2** above).

65 The declaration of a 'national state of disaster' resulted in an earth-shattering regulatory exercise by the Minister. In terms of section 27(2) of the DMA, more than 300 separate regulations, directions and guidelines have been issued by the Minister and other delegated government functionaries. These regulations reorganised and regulated the way in which the public was able to live their lives. To illustrate the extent of legislative work performed by the Executive since March 2020, I attach hereto marked **X5**, a list of all of the regulations, directions and guidelines as published on government's official Covid-19 page since the inception of the declaration of the 'national state of disaster' in March 2020.

66 It is not practical for the applicant to deal with each and every regulation issued by the Minister and other delegated government functionaries over the last two years. These are in any event public documents, and are available.

67 During the start of the outbreak, various mandatory restrictions were implemented in an attempt to limit or curb the spread of Covid-19. These measures included *inter alia*:

67.1 The limiting of travel and/or complete travel bans;

67.2 Lockdown orders requiring that businesses be closed and/or mandating that the public stay within the confines of their homes;

67.3 The limiting of travel across provincial and national borders;

67.4 The limiting of, and at times the ban of, the sale and consumption of alcohol;

67.5 The limiting of religious and social gatherings;

67.6 The limiting of the ability of businesses to operate outside of certain classifications of business;

67.7 The limitation on the sale of certain goods and services;

67.8 The banning of the sale and consumption of tobacco and cigarettes;

67.9 The closure of restaurants and places of entertainment;

67.10 The restriction of tourism and travel to South Africa.

68 The above mandatory restrictions on the general rights and freedoms of the public were specifically declared with the aim of stopping the further spread of Covid-19 and to minimise its effects. Any person found in violation of the Minister's disaster management regulations, may be fined or imprisoned. I attach hereto a poster published on the government's official Covid-19 website during March – April 2020 marked **X6**. This poster summarises the scope and aims of the initial disaster management regulations during 2020.

69 The Minister's initial aims with implementing the 'national state of disaster', was *disrupting the chain of transmission of Covid-19*. With the hope that the disaster management regulations and specifically the mandatory restrictions placed on public freedoms would limit the spread of Covid-19, the President even instructed the deployment of the South African Defence Force ("**SANDF**") to assist the South African Police Services ("**SAPS**") in enforcing the measures. I attach in this regard a press release by the Portfolio Committee on Defence and Military Veterans, dated 24 March 2020, marked **X7**.

70 Over time, the aim of disrupting the transmission of Covid-19, shifted to a strategy of *flattening the curve* of infections. The term is used to describe the objective of creating more gradual increases in the number daily infection cases and a more gradual decrease. The focus is on the number of daily infection cases. This shift was purportedly done in response to *Covid-19* modelling received from various modelling groups, and specifically, the SACMC, which the NICD manages. The models assumed that the country's available hospital and medical resources would not be sufficient to treat people with Covid-19 disease and that mandatory restrictions would be required to prevent a healthcare capacity collapse during a projected surge of cases (initially projected for April and May 2020). I attach hereto marked **X8**, a diagram published on the Covid-19 website of government illustrating the 'flattening the curve model' which motivated the implementation of mandatory restrictions in terms of section 27(2) of the DMA.

71 As the Minister of Health at that time, Dr Zweli Mkhize, explained during a question-and-answer session before the National Assembly on or about 27 May 2020:

> *There are three types of modelling: Projections which estimate new infections and deaths as well as the resources needed for the response; the interventions if fully implemented that can flatten the curve; and the special models which can be used to identify hotspots.*
>
> *According to the South African [Covid-19] Modelling Consortium, the peak of the infection is expected in mid-July in the pessimistic scenario and mid-August in the optimistic scenario. These models should be considered dynamic and is dependent on new data that comes in. It should only be used as a guide for what may be possible.*
>
> *It is estimated that the number of deaths could range between 34 000 to 50 000. All of these figures have also been challenged by other academics… they are open for debate by those who are specialists in the area… We do believe that the models will improve as time goes in and more raw data is fed into their assumptions.*

In support of the above, I attach hereto a copy of the Minister of Health's press release dated 27 May 2020 marked **X9**.

72 During the same question and answer session before the National Assembly, the Minister of Health stated that government was focusing on increasing the country's hospital and medical capacity by employing additional nurses in *inter alia* the Western Cape and Eastern Cape, and also employing the services of more doctors. All of this was done under the assumption that the Covid-19 outbreak could be contained, as made clear by the Minister of Health's statement before Parliament on 27 May 2020:

> "*We are very grateful for the support of the Cuban doctors. Over the weekend they were distributed to all the provinces and indeed there is a group of 28 dispatched to the Western Cape. They have been warmly received… They are coming to reinforce the work being done by the team in the Western Cape. This team in the Western Cape is doing their best to try and contain the outbreak.*"

73 However, by July 2020, it became clear that models relating to the containment of Covid-19 were unrealistic. The strategy clearly shifted from containment and contact tracing, to one of focusing on increasing national hospital and medical capacity to treat Covid-19. The augmented strategy was explained by the Minister of Health at another question-and-answer session before the National Assembly on 8 July 2020. In this regard, I attach a copy of the press release issued on 8 July 2020 marked **X10**. Government's position by July 2020 was as follows:

73.1 Government's response was still based on the so-called pessimistic modelling projections of the SACMC. The Minister, however, by July 2020 admitted before Parliament that the actual infections in May and June 2020 were even lower than the optimistic projected curve. The Minister stated:

"Model projections indicate that while the epidemic is predicted to peak nationally at a similar time to the previously projected optimistic curve (that is mid-August), it does so at a lower level. This means that fewer people were infected in May and June than was previously predicted even under the optimistic scenario."

73.2 Government's models continued to predict that "[…] *ICU beds at a national level, bed capacity is still expected to be breached or overwhelmed in all provinces*".

73.3 In order to increase hospital capacity, the department had built several so-called *field hospitals*. By July 2020, three field hospitals were being constructed in the Western Cape, one in Gauteng at the NASREC centre,

one in Pietermaritzburg, KwaZulu Natal, and one in Port Elizabeth, Eastern Cape.

74 The exact number of hospital and ICU beds available during 2020 has been challenging to determine due to a general lack of accurate publicly available data. According to a report by the Academy of Science of South Africa published in 2021, South Africa had 93 295 acute hospital beds available, with 6 040 critical care beds, 3 318 ICU beds and 2 722 high care beds available between both the private and public sectors. I attach a copy of the report hereto marked **X11**. Some estimates however show that there were approximately 133 000 hospital beds available during 2020 (85 362 public and 31 067 private).

75 The mandatory measures implemented were over time classified into five lockdown alert levels:

75.1 **'Alert Level 1'** indicates a low Covid-19 spread with a high health system readiness;

75.2 **'Alert Level 2'** indicates a moderate Covid-19 spread with a high health system readiness;

75.3 **'Alert Level 3'** indicates a moderate Covid-19 spread with a moderate health system readiness;

75.4 **'Alert Level 4'** indicates a moderate to a high Covid-19 spread with a low to moderate health system readiness;

75.5 **'Alert Level 5'** indicates a high Covid-19 spread with a low health system readiness.

South Africa has remained on various Alert Levels since 26 March 2020.

DEATH AND HOSPITALISATION PROJECTIONS

76 The Minister's response to Covid-19 in 2020 and 2021 was based on modelling projections, especially the modelling projections published by the SACMC.

77 On 6 May 2020, the SACMC published a report called *Estimated cases for Covid-19 South Africa: Long-term national projections (Report update: 6 May 2020).* A copy of this report is attached hereto marked **X12** and a copy of the accompanying media briefing is attached hereto marked **X13**.

77.1 The SACMC estimated that between 34 015 and 49 774 Covid-19 related deaths would occur by 1 November 2020.

77.2 That mandatory interventions (in the form of a hard lockdown) would *flatten the curve* and delay *the peak* of infections *by 2 to 3 months depending on the strength of the public's adherence to the lockdown and social distancing measures.*

77.3 That South Africa would see a peak demand for hospital and ICU beds between August and September 2020.

77.4 That based on *resource levels, model projections indicate that the number of available hospital and ICU beds will likely be exhausted by July* [2020].

77.5 The model was based on two scenarios, namely an optimistic scenario and a pessimistic scenario.

78 In terms of the projections of the SACMC, South Africa, by 18 July 2020, would:

78.1 in terms of pessimistic projection, require 85 959 hospital beds to treat patients with severe disease and 34 855 ICU beds to treat the most severe cases of severe disease.

78.2 in terms of optimistic projection, require 72 465 hospital beds to treat patients with severe disease and 24 538 ICU beds to treat the most severe cases of severe disease.

79 Over the period of May 2020 until September 2020, the SACM also projected that South Africa could by 1 November 2020 expect one of the following potential total infection mortality rate scenarios:

79.1 An optimistic infection mortality death rate of 51 446 deaths nationwide, with a potential pessimistic infection mortality rate of 54 774 deaths nationwide (the initial scenario);

79.2 An optimistic infection mortality death rate of 40 671 deaths nationwide, with a potential pessimistic infection mortality rate 43 457 deaths nationwide (the first adjusted scenario);

79.3 An optimistic infection mortality death rate of 32 230 deaths nationwide, with a potential pessimistic infection mortality rate 34 103 deaths nationwide (the second adjusted scenario).

80 The SACMC models were understandably adjusted from time to time as more data regarding the scope and magnitude of Covid-19 became available. I would, however, submit that the SACMC models, and especially their projections

regarding the scope and magnitude of Covid-19 in as far as it would have an impact on hospital resources, had a significant effect on the Minister's decisions to not only declare a 'national state of disaster', but also to maintain her DMA regulations and the continued extension of the framework created.

COVID-19 WAVES

81 Throughout the Covid-19 outbreak, major emphasis has been placed on the recurrence of so-called infection waves. Two major data points were used to determine the occurrence of a wave: the total reported daily Covid-19 infection-related hospitalisations and the total reported daily infection-related deaths.

82 To date, South Africa has faced four identifiable waves, namely:

82.1 The first wave starting during or about June 2020 and peaking in August 2020;

82.2 The second wave starting during or about December 2020 and peaking in January 2021;

82.3 The third wave starting during or about June 2021 and peaking in July 2021; and

82.4 The fourth wave starting during or about December 2021 and peaking in January 2022.

83 I refer to figure **PF01** below, which has been sourced from the World Health Organisation website for South Africa, in support of the above.[1]

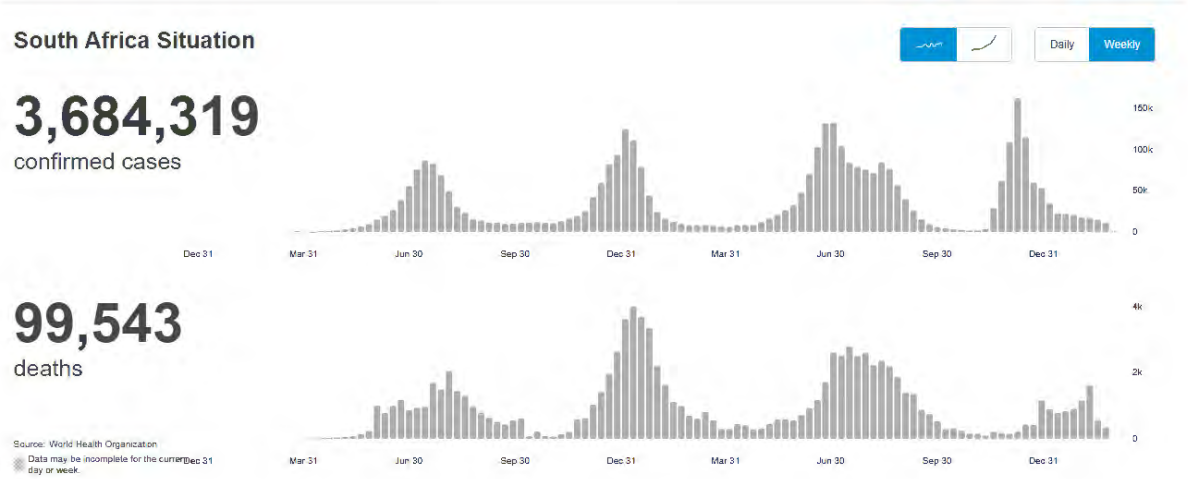


Figure PF01

ACTUAL INFECTION MORTALITY AND HOSPITALISATION RATES IN 2020

84 By the start of 2021, it became clear that most of the SACMC projections (I refer back to paragraphs 76 - 80 above), were overstated:

84.1 The actual hospital and ICU beds utilised by 18 July 2020 to treat patients with Covid-19 was 4 705 (hospital) and 2 308 (ICU) beds respectively. Both the pessimistic as well as the optimistic projections by the SACMC were therefore overstated. In the case of hospital beds, the SACMC projection was overstated by a factor of x14 (optimistic projection) and a factor of x18 (pessimistic projection). In the case of ICU beds, the SACMC projection was overstated by a factor of x13 (optimistic projection) and a factor of x15 (pessimistic projection).

[1]Source:https://www.who.int/data/gho/data/countries/country-details/GHO/south-africa?countryProfileId=e5bf5e3c-86a3-421f-89cc-18d787c36968 and https://covid19.who.int/region/afro/country/za as on 8 March 2022

84.2 The actual national Covid-19 infection mortality rate by 1 November 2020 was 19 411 deaths, significantly lower than the initial projections of 51 446 (optimistic) and 54 774 (pessimistic) deaths (or any of the later adjusted models published by the SACMC in 2020). In this regard, I attach a press release by the Minister of Health hereto marked **X14** dated 1 November 2020 confirming the infection mortality rates on 1 November 2020.

HOSPITAL CAPACITY

85 One of the essential features that differentiate an ordinary disaster or severe adverse event from a statutory 'disaster' in terms of the DMA is the issue of the availability of already present resources available to the public to deal with the adverse event. There may be many severe adverse events that the public deem to be disasters, which will not necessarily qualify as an objective disaster in terms of the DMA. On a proper interpretation of the DMA, it is clear that one of the key requirements for a severe adverse event to qualify as a 'disaster' under the DMA, is the availability of resources (both public and private).

86 The previous paragraphs have already discussed government's efforts in building out hospital capacity. As already shown in this affidavit, government's initial response to Covid-19 was based on various projections which attempted to model the projected future death and hospitalisation rates associated with Covid-19 disease. Based on these projections, government focused on expanding the number of hospital facilities, beds, nursing staff and doctors across the country.

87 The NASREC Field Hospital was commissioned during or about April 2020 in order to supplement the already available hospital beds in Gauteng. The NASREC Field Hospital alone was intended to add an initial 500 beds with a capacity of 2 300 beds. I attach hereto in support hereof, marked **X15**, a press release by the Gauteng Provincial Government dated 14 April 2020. The press release also clearly illustrates reasons why the extraordinary field hospital was being created. According to the Gauteng MEC: Health, Bandile Masuku:

> *"We are planning for the eventuality, that at is peak, the pandemic will get very bad," said Masuku*
>
> *According to Professor Salim Abdool Karrim – Chairperson Ministerial Advisory Group on COVID-19, there are going to be thousands of people needing medical care all at the same time. They are going to need a most complicated level of care that the province can provide, and as such advised that it's best to be overprepared than underprepared."*

88 However, on 25 February 2021, the Gauteng Provincial Government announced that it would be closing and decommissioning the NASREC Field Hospital at the end of February 2021. In a media statement published by the province, a copy of which is attached hereto marked **X16**, it confirmed that:

> *"This is due to the expansion of the public healthcare system that has seen 4 265 functional beds being added and the evidence-based scientific advice given by the provincial modelling team.*
>
> *This was announced by the Gauteng MEC for Health, Dr Nomathemba Mokgethi on Thursday, stating that there were no longer any scientific, statistical, or clinical reasons to keep the facility open […]*
>
> *The NASREC Field Hospital was initially secured in April last year as a 500-bed isolation and quarantine site to accommodate members of the public who could not self-isolate or quarantine at home. The facility was later extended to include 1000 beds to accommodate Priority free*

patients informed by projected infection peak in numbers anticipated for August 2020 emerging from modelling exercises at the time. […]

Since opening 1658 patients were admitted at the NASREC Field Hospital, broken into the following categories, 1254 for isolation, while 117 were admitted for quarantine and 287 Priority 3 patients to date."

89 Despite the hospital system coming under considerably more pressure during the subsequent third wave, the NASREC Field Hospital remained closed. As explained by the Gauteng MEC: Health in the above press release, capacity issues could by that time be effectively managed by the province:

"Bed overload within hospital clusters will be managed through internal transfers between hospitals to relief areas of shortage within clusters," assured the MEC."

90 In a similar fashion to the NASREC Field Hospital, other field hospitals across the country were being closed during the period of August 2020 to February 2021. According to media reports, the major field hospitals erected at the Cape Town convention centre and in Khayelitsha were all closed by the Western Cape provincial government by the end of 2020. According to media reports, the field hospitals were closed due to underutilisation and the expansion of hospital capacity within the already existing hospital network. I attach hereto in this regard a media report dated 29 December 2020, marked **X17**, in which the closure of the above field hospitals was confirmed.

91 Despite public debate the field hospitals in the Western Cape and Gauteng during the second and third waves remained closed.

92 The applicant submits that the closing of the field hospitals at the end of 2020, during the peak of the dreaded second wave, confirms that the country indeed

had sufficient hospital capacity at that time already to receive and treat people affected by Covid-19 disease.

93 By stating this the applicant is not denying that certain hospitals were under severe pressure at certain points in time. The ordinary rules of supply and demand continue to apply during any adverse event. The resource constraint is however a manageable one. Specific hospitals might receive higher demand during certain times, whilst, as the MEC: Health for Gauteng indicated above, others might at the exact same time sit with a higher bed availability.

OMICRON VARIANT

94 According to the World Health Organisation, the second wave in South Africa, at its peak, reported 4 027 Covid-19 infection-related deaths out of a total of 125 287 cases for the week of 11 January 2021.[2]

95 According to the World Health Organisation, the third wave peaked in the week of 19 July 2021, with a total of 2 812 deaths reported out of 104 853 cases in that week.[3] However, the third wave was of a longer duration and had more infection-related deaths in general.

96 The fourth wave in South Africa peaked during or about the week of 14 February 2022, with a total of 1 632 deaths reported out of 16 929 cases in that week.[4] According to World Health Organisation data, the week of 21 February 2022 showed an even sharper decrease in deaths, totalling 574 deaths out of 14 900

[2] Ibid

[3] Ibid

[4] Ibid

cases. The week of 28 February 2022 followed in a similar suit with 352 deaths out of 11 181 reported cases.

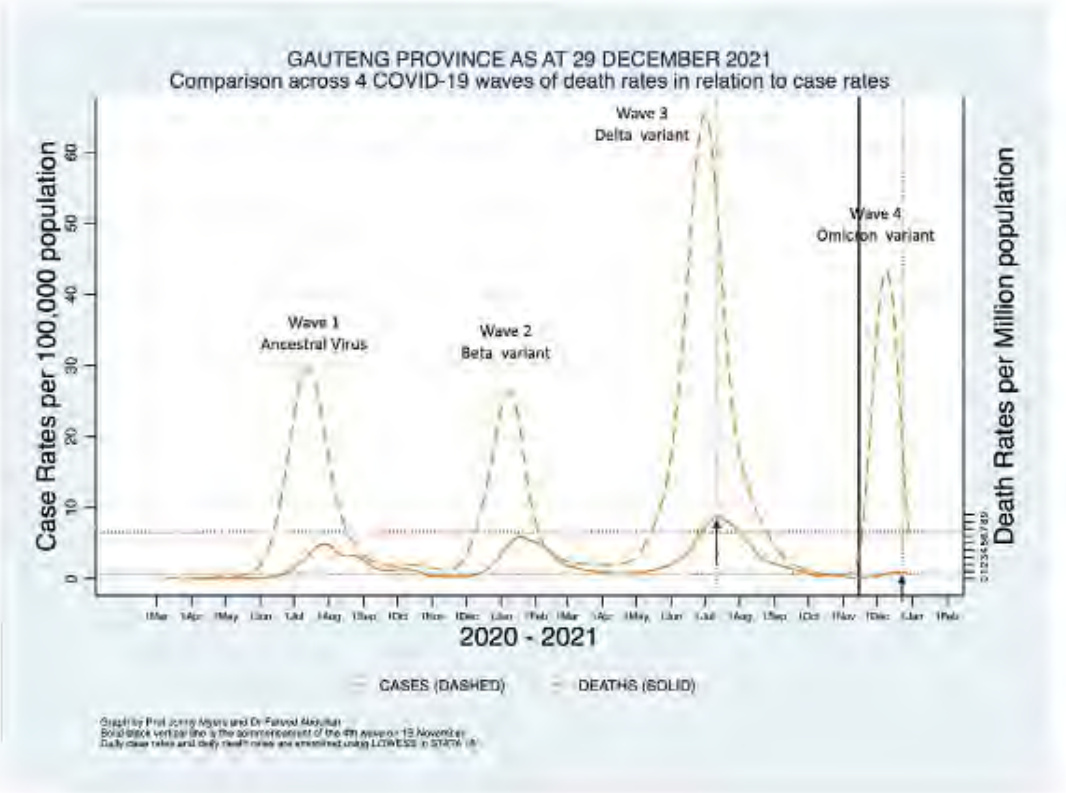
97 The data published by the SACMC as of 8 March 2022 supports the World Health Organisation reports, finding that hospitalisations and deaths across all provinces have sharply decreased throughout the third and fourth waves. I attach hereto in support hereof, marked **X18**, the hospitalisation death data graphs as published by the SACMC on their website.[5]

98 The pressure on the South African hospital and medical system has continued to decrease since the peak of the third wave. This decrease in Covid-19 infection mortality has been ascribed to a less deadly Omicron variant.

99 According to a research paper published by South African researchers in the International Journal of Infectious Diseases on 22 December 2021, titled *Decreased severity of disease during the first global omicron variant covid-19 outbreak in a large hospital in Tshwane, South Africa* (a copy of which is attached hereto marked **X19**):

99.1 [Under Omicron] "*an uncoupling of the case and death rates for the Gauteng Province as a whole* [has been noted]*, confirming the local hospital experience of significantly fewer admissions to the ICU and deaths compared to previous waves*." I refer the Honourable Court to the diagram below, which formed part of the research report, illustrating the collapse in mortality rates under Omicron:

[5] Source: https://www.sacmcepidemicexplorer.co.za/ as on 8 March 2022.



99.2 *"Peak bed occupancy was about half that of the third (Delta) wave suggesting a lower rate of hospital admissions relative to the number of cases in the Omicron wave compared to previous waves."*

99.3 *"Fewer ICU admissions and deaths and a shorter length of hospital stay indicate decreased severity of disease caused by the Omicron variant. A third of deaths resulted from a cause other than COVID-19, and there were no paediatric deaths related to severe COVID-19 disease. Sixty three percent of COVID-19 patients in the snapshot at peak bed occupancy were in hospital for an alternative primary diagnosis, and were 'incidental COVID' patients as they were diagnosed as the result of hospital admission procedures, rather than having the typical clinical profile or meeting a case definition for COVID."*

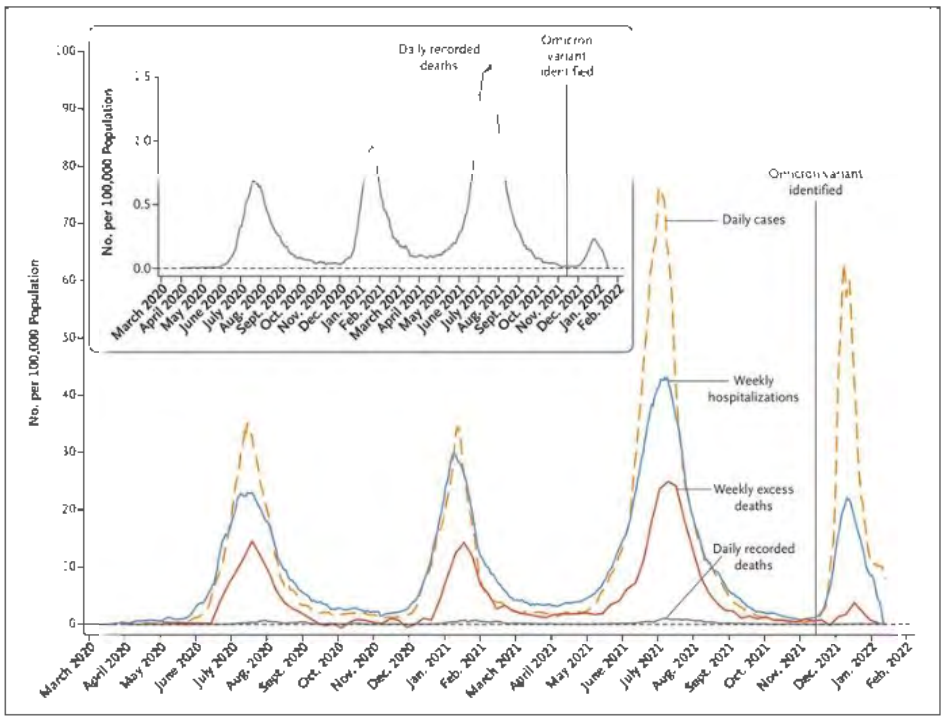
99.4 *"There are clear signs that case and admission rates in South- Africa may decline further over the next few weeks. If this pattern continues and is repeated globally, we are likely to see a complete decoupling of case and death rates, suggesting that Omicron may be a harbinger of the end of the epidemic phase of the Covid pandemic, ushering in its endemic phase."*

100 A study published by South African researchers in the New England Journal of Medicine on 23 February 2022 titled *Population Immunity and Covid-19 Severity with Omicron Variant in South Africa* (a copy of which is attached hereto marked **X20**) found that:

100.1 *"[P]eak incidences of hospitalization, recorded death, and excess death in the fourth wave were lower than the peak incidences in previous waves. The fourth wave contributed 11.2%, 3.9%, and 3.3% of overall hospitalizations, recorded deaths, and excess deaths due to Covid-19, respectively, whereas the third wave, in which the delta variant was dominant, contributed 43.6%, 49.3%, and 52.7%."*

100.2 *"[W]e observed a dramatic decoupling of hospitalizations and deaths from infections during the fourth wave of Covid-19, as compared with the proportions seen during the three previous waves. The biologic basis for this decoupling could be the extensive cell-mediated immunity in the population that was induced by previous natural infection and vaccination."*

100.3 The decoupling of hospitalisations and deaths from infections is illustrated by the below figure which researchers included in their paper, which shows a sharp decrease in infection mortality, even though infection rates might rise:



100.4 The researchers found that seropositivity for Covid-19, was prevalent in at least 85% of cases. This means that no less than 85% of people in South Africa already have some form of immunity against Covid-19.

101 According to a further article (a copy of which is attached hereto marked **X21**) published on 1 March 2022, by Professor Shabir Madhi, the Dean of Health Sciences and professor of vaccinology at the University of the Witwatersrand (who is also one of the authors of the study published on 23 February 2022):

101.1 *"The omicron wave was associated with 10% of all hospitalisations since the start of the pandemic, whereas 44% of hospitalisations had transpired during the course of the Delta variant wave. More impressively, only 3%*

of COVID deaths since the start of the pandemic occurred during the omicron wave, compared with 50% during the delta dominant wave."

101.2 *"Another resurgence is likely, and there might well be another variant. But it would be very surprising if further variants are able to evade the T-cell arm of the immune system which is stimulated by vaccines and natural infection."*

101.3 *"So why do I believe that we are at the tail end of this pandemic? It depends what metric you use. If it's about infections, we're not at the tail end. If it's about the number of deaths that will transpire from COVID-19 during 2022, relative to the number of deaths that will transpire from other preventable causes of death in countries such as South Africa, then I believe the country has pretty much arrived towards the end of this pandemic."*

101.4 *"In South Africa about 10,000 to 11,000 people die of seasonal influenza every year. In 2019 tuberculosis killed 58 000 in 2019. But we are not declaring an emergency in South Africa to deal with flu or tuberculosis. Deaths from HIV, and complications from HIV, are about 70,000. But South Africa isn't shutting down the country to prevent deaths and infections from these diseases."*

102 I accordingly submit that as at the date of the latest extension of the declaration of the national state of disaster (and in fact for some time before this, and currently):

102.1 Our medical profession has sufficient resources and knowledge to treat people with Covid-19;

102.2 Covid-19 cases are not overrunning the practices of frontline doctors;

102.3 Covid-19 does not present a high risk of death or severe disease;

102.4 Hospitals are not being overrun and that all of their patients who require hospital admission can gain access to treatment; and

102.5 There is currently no factual basis to project that Covid-19 will become more dangerous.

ALL RISK NO BENEFIT

103 The economic cost of the declaration and extension of a state of disaster has been devastating.

104 The continuous extension of the declaration of the national state of disaster is not an innocuous event that does not cause harm. The uncertainty created thereby has significant financial and economic costs for the Republic of South Africa and its people.

105 It is further relevant that the restrictions on the rights of the people of South Africa and the negative effects that the extension of the declaration of a 'national state of disaster' entails have a disproportionate impact on vulnerable groups, including *inter alia* vulnerable workers, people operating in the informal sector, persons with disabilities, homeless people and small businesses. The negative economic effects of the extension of the declaration of a 'national state of disaster' are harder on socio-economically vulnerable groups.

106 Mandatory restrictions and lockdowns employed by the government in their attempt to curb the spread of Covid-19 failed to account for how human beings actually behave in the real world. These restrictions implemented under the 'national state of disaster' overestimated the ability of mandatory restrictions to effectively manage a highly complex public risk.

107 It is the applicant's position that the mandatory restrictions implemented by the Minister since declaring a 'national state of disaster' have not only failed in reaching the ostensible governmental purpose for which it was employed (i.e. curbing the spread of Covid-19 and later 'flattening the curve' of hospitalisations), but have in fact caused much more harm than good.

108 The applicant is supported by a study titled *A literature review and meta-analysis of the effects of lockdowns on Covid-19 mortality*, published in January 2022 by the Johns Hopkins Institute for Applied Economics, Global Health and the Study of Business Enterprise. A copy of the study is attached hereto marked **X22**.

109 The aforementioned study was a meta-analysis summarising the highest quality research available into the impact of mandatory restrictions implemented under emergency governmental powers across the globe (which include restrictions on social gatherings, business closures, so-called stay-at-home orders, and lockdown mandates). The study found that mandatory restrictions have a negligible impact on saving lives from Covid 19 and did enormous social and economic damage at significant cost to people's health, lives and livelihoods.

110 According to the Johns Hopkins researchers, mandatory interventions had negligible, if any, effect on curbing Covid-19 deaths over and above a scenario of voluntary mitigation measures. Indeed, the analysis concluded that mandatory

interventions yielded *enormous* detrimental consequences for social order and the economy. The researchers state unequivocally that *lockdown policies are ill founded and should be rejected as a pandemic policy instrument,* adding that:

> "*[…] lockdowns during the initial phase of the COVID-19 pandemic have had devastating effects. They have contributed to reducing economic activity, raising unemployment, reducing schooling, causing political unrest, contributing to domestic violence […]*"

111 A continuance of the declaration of the 'national state of disaster' is a continuance of the threat of increased mandatory restrictions on business and public life, and it will continue to damage the economy and hamper recovery. It is also clearly an unnecessary and futile regulatory exercise.

THERE IS NO DISASTER AS DEFINED IN THE DMA

112 As at the date of the last extension of the declaration of a 'national state of disaster', there was no 'disaster' as defined in the DMA. There is currently no disaster as defined in the DMA.

113 The current state of Covid-19 in South Africa, and the state of Covid-19 as at the date of the last extension of the declaration of a 'national state of disaster', is objectively not of a magnitude that exceeds the ability of those affected by Covid-19 to cope with its effects using currently available resources.

114 For an occurrence to qualify as an objective statutory 'disaster' it must be of such magnitude that it is beyond the resource capabilities of those affected by it. Objectively this is not so currently nor at the date of the last extension of the declaration of a 'national state of disaster'.

115 It is apparent that neither the National Centre (nor its Head) nor the Minister applied their minds to this vital question, and that they failed to ask themselves the correct question when deciding to extend the declaration of a ‘national state of disaster’.

116 The Minister and the National Centre failed to comply with the mandatory requirements applicable to each such state functionary in terms of the DMA.

117 The Minister has failed to act within the confines of the enabling legislation. The decision of the Minister is not lawful, reasonable, rational, or procedurally fair.

118 The conditions in respect of Covid-19 in 2022 are very different to those uncertain times that prevailed in March 2020. The current conditions in 2022 are such that objectively there is no statutory ‘disaster’ as defined in the DMA.

119 The Minister had no regard to the current magnitude and severity of the occurrence when deciding to extend the declaration of a ‘national state of disaster’. This is apparent from the Minister's own decision to extend the ‘national state of disaster’ on 14 February 2022 (a copy of which is attached hereto marked X2). In terms of the decision, the Minister's decision to extend the ‘national state of disaster’ is based solely on "... *taking into account the need to continue augmenting the existing legislation and contingency arrangements undertaken by organs of state to address the impact of the disaster …*".

THE NATIONAL CENTRE HAS NOT CONFIRMED THAT THE OCCURRENCE REMAINS A DISASTER

120 The National Centre must confirm that a disaster is a ‘national disaster’ before the Minister may extend the declaration of a ‘national state of disaster’. The

National Centre must make such determination as at the date of the decision to extend. To this extent the applicant in a letter dated 17 January 2022 requested the National Centre to disclose whether any reassessments of the 15 March 2020 declaration of a 'national disaster' had been undertaken by the National Centre. A copy of this letter is attached hereto marked **X23**.

121 Apparent from a letter received from the Head of the National Centre , a copy of which is attached hereto marked **X24**, the only determination done in respect of the classification of the disaster was done on 15 March 2020 (about 23 months prior to the most recent extension of the declaration by the Minister).

122 The National Centre has not independently considered whether its original classification (of 15 March 2020) prevails currently. The objective facts demonstrate that the occurrence is currently not a 'disaster', and that it was not a disaster as at 14 February 2022. The National Centre has acted contrary to and outside of the empowering legislation. This is fatal to the extension performed by the Minister.

123 As has been set out above, the Minister has no power to declare a national state of disaster, nor to extend such declaration, in the absence of an independent, rational, and reasonable classification by the National Centre, acting in terms of the empowering legislation. This has not occurred in respect of the latest extension of the declaration.

124 The classification and determination by the National Centre are fundamental to the lawfulness of the decision of the Minister to extend the declaration of a national state of disaster. In terms of the DMA, a national state of disaster may only be declared and extended by the Minister based on a classification of a

national disaster by the National Centre, which classification must be relevant to the circumstances that prevail at the time. It is entirely unreasonable, irrational, and unlawful to rely on a classification that was made almost 2 years ago, and this renders the decision of the Minister in contravention of the enabling legislation and the law.

125 By passing legislation making powers to the Minister via the DMA (as opposed to the declaration of a state of emergency), the scrutiny and conditionality that normally attach to the use of emergency powers can be avoided. This is all the more reason, the applicant submits, to ensure that the rule of law is complied with and that the principle of legality is properly applied. Without effective mechanisms for scrutiny, legal or constitutional safeguards are rendered moot.

126 The provisions in the DMA regarding classification serve a crucial constitutional function. They serve as a check on executive power by separating the objective evaluation of an adverse event, as a disaster or not, from the executive step of declaring a national state of disaster. The duty of the National Centre to independently classify is further underpinned by the Constitution, which demands that all public office bearers use their powers to protect and advance the constitutional rights of the public. The Minister has assumed extraordinary executive power, with the ability to make law in terms of regulations and directives, since March 2020. The checks which serve the crucial constitutional function are absent and have not been performed.

127 The objective requirements addressed above, together with the duties that the National Centre is required to comply with in the determination of such objective

requirements, constitutes a legal or constitutional safeguard on the use of the powers contained in the DMA.

128 Contrary to the duties of the National Centre under the DMA, the regulations thereto, and the Constitution, the National Centre has abdicated its responsibilities and deferred to the Minister and the other respondents to make decisions which the National Centre is tasked to make.

129 The National Centre has failed to assess whether the occurrence remains a 'disaster', and if so, whether it remains a 'national disaster' or not.

EXISTING LEGISLATION AND CONTINGENCY ARRANGEMENTS, AND SPECIAL CIRCUMSTANCES

130 The Minister may only extend the declaration of the 'national state of disaster' if at date of the decision to extend such declaration -

130.1 existing legislation and contingency arrangements do not adequately provide for the national Executive to deal effectively with the disaster; or

130.2 other special circumstances warrant the extension of the declaration of a national state of disaster.

131 In fact, the DMA (section 2(1)(b)) expressly records that the Act does not apply in the circumstances where an occurrence which is in fact a 'disaster' (as defined in section 1 of the DMA), can be dealt with effectively in terms of other national legislation aimed at reducing the risk, and addressing the consequences, of occurrences of that nature.

132 As has been demonstrated in terms of the objective evidence, Covid-19 currently can be dealt with in terms of the laws of the Republic of South Africa, and this was the case as at 14 February 2022.

133 There are no exceptional circumstances that warrant the extension of the declaration of a 'national state of disaster', and there were no such circumstances as at 14 February 2022.

LAWFULNESS OF CONDUCT

134 The National Centre is the most important structure that the DMA creates. The National Centre is an institution within the public service. Its objective is to "... *promote an integrated and coordinated system of disaster management, with special emphasis on prevention and mitigation, by national, provincial and municipal organs of state, statutory functionaries, other role-players involved in disaster management and communities ..."* (section 9 of the DMA).

135 The Minister does not have a carte blanche to continue maintaining the declaration of a 'national state of disaster' if the objective grounds for classifying an adverse event as a statutory 'disaster' are not present.

136 The granting of extraordinary powers to the Minister in terms of the DMA must be temporary and must expire as soon as these are objectively no longer necessary or where the jurisdictional preconditions for such extension are not met. The continuous extension of the declaration of a national state of disaster is not necessary, proportionate or temporary in nature, and breaches basic constitutional rights and the principle of legality.

137 An argument by the state respondents that the Minister is not currently exercising her legislative rights in terms of section 27(2) of the DMA to any great extent misses the point. The point is that such powers do not vest in the Minister at all absent the objective requirements. The point is further that the continuous extension of the declaration deprives Parliament of its fundamental duty, and upsets the balance of the separation of powers. Without parliamentary oversight to enforce constitutional norms and safeguards, limits on the use of power are just words on paper.

138 The National Centre must determine whether the objective requirements of a 'disaster' have been met. The National Centre cannot abdicate its statutory duties or delegate such duties to another organ of state or the Minister.

139 The Minister cannot act in terms of section 27 unless and until the National Centre classifies that a 'national disaster' exists. The Minister is only responsible for managing a 'disaster'.

140 Furthermore, the Minister's powers may only be exercised to the extent necessary to assist the public. However, if it is possible for the public to manage the effects of a 'disaster' out of its own or publicly available resources or if it becomes evident that publicly available resources are sufficient to address the risks associated with an adverse event, the exercise of power by the Minister no longer becomes reasonable or effective.

141 The applicant submits that this is, for the reasons above and such further reasons which the applicant will raise on filing its supplemented papers, the case and that it is not reasonable for the Minister to extend the ‘national state of disaster’.

142 Furthermore, the applicant submits that the Minister's power of extension under section 27(5) of the DMA is subject to the same requirements as her original declaration in terms of section 27(1).

143 Accordingly, the applicant submits that a failure by the National Centre to continuously consider its classification of Covid-19 as a 'national disaster', constitutes a material and unconstitutional failure to perform its duties under the DMA.

REVIEW OF DECISION

144 The conduct of both the National Centre as well as the Minister, falls within the ambit of the exercise of public power. Such conduct must be reasonable and be both substantively and procedurally rational.

145 The making of regulations and the proclamation of classifications under the DMA, constitute administrative action and necessitates that the decision:

145.1 be rationally connected to a legitimate governmental purpose;

145.2 takes into consideration all relevant information;

145.3 have a rational basis.

146 Furthermore, the decisionmaker must ensure that his/her decisions are lawful and made within the boundaries of the authority granted to him/her. A decision may also not be arbitrary or capricious. The decision must also stand up to constitutional scrutiny.

147 The National Centre as well as the Minster's conduct, as already shown above, have failed in their duty to properly administrate their powers under the DMA.

148 The extension of the declaration is not rationality related to the purpose for which the power was given to the Minister. The National Centre and its Head failed to make the necessary information available to the Minister. Objectively, as at date of the latest extension, there was no disaster. There is no rational connection between the objective facts and the decision taken by the Minister to extend the declaration.

149 The applicant submits that the extension of the 'national state of disaster' and the continued classification of Covid-19 as a 'national disaster', should be reviewed and set aside under both the principles of legality and administrative action.

UNCONSTITUTIONALITY OF SECTION 27(5)(c)

150 The applicant submits that DMA does not provide adequate safeguards and independent oversight over the Minister and national Executive concerning the duration and extension of a 'national state of disaster'.

151 Section 27(2) grants extraordinary and broad powers to the Minister. Section 27(2)(n) can and has been used throughout the declared 'national state of disaster' as a general authorising provision in making regulations that limit the public's general constitutional rights and freedoms. These powers can and have allowed the Minister the power to institute mandatory restrictions of the nature already referred to in paragraph 67.

152 These emergency powers are not entirely unlike the emergency powers granted to the Executive in the event of a state emergency declared in terms of section 37 of the Constitution. Unlike section 37 of the Constitution, the Minister's powers under the DMA do not require the oversight of Parliament, and there is no limitation or constraint on the extension of emergency powers under section 27 of the DMA.

153 No mechanism in the DMA affords actual independent oversight over the extension of emergency powers by the Minister under the DMA. The applicant submits that even though the National Centre might technically act as a check on the Minister's power if it declassifies a 'disaster', no speedy recourse is available to the public for the restitution of derogated constitutional rights in the event of a protracted disaster. The applicant submits that protracted disasters would, at some point, become a 'new normal' that the public and that the extended exercise of emergency powers over protracted periods would constitute a derogation of rights (and not a mere limitation thereof) which affronts the basic principles of a free and democratic state and the rule of law. It is constitutionally improper to expect that the public litigate their way out of a protracted derogation of rights by the Executive.

154 The applicant also submits that the National Centre does not necessarily provide a genuinely independent check on the Executive, especially seeing that the Head of the National Centre is also a public official within the Minister's department. A true constitutional separation of powers requires an actual separation of powers.

155 The main place of legislating is Parliament and not the Executive. The Parliamentary law-making-process advances the principles of openness,

accountability, transparency and public participation. Where the Executive is permitted to arrogate to itself such function (of law-making), without the necessary checks and balances from a truly independent sphere of government, the doctrine of the separation of powers and the rule of law are breached, the principles of openness, accountability, transparency and public participation are flouted, and the engine-house of our democracy, Parliament, stalls. This, I respectfully state, is the effect of the vague provision that is section 27(5)(c).

156 The section is unconstitutional and contrary to the rule of law insofar as it not only allows the Minister unilaterally to delegate the law-making function to herself, but to indefinitely perpetuate her reign as lawmaker, for a month at a time, permitting the extension determination (and concomitant legislative powers) to be up to the sole discretion of the Executive.

FURTHER DEMANDS MADE

157 In addition to the demand directed to the National Centre on 17 January 2022, and the subsequent response received (I refer to paragraphs 120 and 121 above), the applicant also on 12 January 2022 directed a letter via its attorneys, KWV, to the President, the Minister, the Minister of Health and the National Centre (a copy of which is attached hereto marked **X25**) in which the applicant demanded that:

157.1 the National Centre reconsider the classification of Covid-19 as a 'national disaster';

157.2 the Minister terminate the 'national state of disaster'.

158 On 31 January 2022, the applicant's attorneys again directed a letter at the President, Minister, Minister of Health and National Centre, indicating that the failure by the government to respond to the applicant's letters and the failure to reconsider the classification of Covid-19 as a 'national disaster', will force the applicant to approach the Court in the public interest for relief. A copy of this letter is attached hereto marked **X26**.

159 On 7 February 2022, the Minister responded to the applicant's letters. I attach a copy of the response hereto marked **X27**. In the reply, the Minister indicated that a *"[s]pecific date by which the national state of disaster is to be lifted cannot therefore be provided at this stage but it is important to reiterate that all restrictions will be lifted and the national state of disaster will be terminated as soon as it is determined to provide to the public, protecting property, preventing or combatting disruption or dealing with the destructive and other effects of the disaster.*

This in effect means that I am not in a position to accede to your clients' demand to terminate the 'national state of disaster', or alternatively refuse to extend the 'national state of disaster', and withdraw all regulations issued under section 27(2) of the Disaster Management Act, 2002."

160 As is apparent from the conduct and response of the Minister, it is easier to take power than to return it. The pandemic has provided a mechanism and guise to assume power, and to consolidate power within the Executive. It is time for the Minister to relinquish the powers that she has assumed under the DMA for almost two years now, and to which she, impermissibly and unconstitutionally, continues to hold onto tightly for a month at a time.

SUPPLEMENTATION OF PAPERS

161 I am advised that once the respondents have made the record/s available, with such reasons that they are required or that they may wish to furnish, as is referred to in the notice of motion prefixed hereto, the applicant is entitled to add to or amend the terms of its notice of motion and to supplement its founding affidavit herein. The applicant reserves it's right to do so in terms of uniform rule of court 53(4).

162 The applicant also anticipates that the respondents will try and argue that this application would have become moot with every further extension of the 'national state of disaster' or any future alternative declaration of a 'national state of disaster'. The applicant reserves the right to amend and supplement its papers to include and anticipate any future declarations or extensions of the 'national state of disaster'. The applicant submits that the only way for the public to challenge the decisions of the Minister effectively is for these papers to be supplemented.

CONCLUSION

163 The applicant seeks the relief and orders as set out in the notice of motion.

PIETER JACOBUS LE ROUX

I HEREBY CERTIFY THAT THE DEPONENT HAS ACKNOWLEDGED:

(a) he knows and understands the contents of this affidavit;

(b) he has no objection to taking an oath;

(c) he considers the oath to be binding on his conscience.

THUS signed and sworn before me, at **PRETORIA** on this the _____ day **MARCH 2022**, the Regulations contained in Government Notice No. R1648 of 19 August 1977 (as amended) having been fully complied with.

_____

COMMISSIONER OF OATHS
FULL NAMES:
BUSINESS ADDRESS:
DESIGNATION:
AREA / OFFICE:

teenstrydigheid effektiewelik aan te spreek, en

3.3.3. Die aksies neem wat binne hul uitsluitlike diskresie nodig is om die oortreding, botsing en/of teenstrydigheid aan te spreek, wat insluit maar nie beperk is tot die voorstel van wysigings tot die Akte en die belê van 'n spesiale Ledevergadering ten einde daardie wysigings goed te keur.

4. DOELSTELLINGS EN MAGTE VAN DIE MAATSKAPPY

4.1. Ter nakoming van artikel 1 van bylaag 1 tot die Wet, verklaar die Maatskappy hiermee die volgende hoofdoelstellings:

4.1.1. Die bevordering van konstitusionele orde, vryemarkbeginsels en 'n kapitaalkragtige, regverdige, en volhoubare sake-omgewing in die Republiek;

4.1.2. Die skepping van 'n selfstandige sakegemeenskap in die Republiek;

4.1.3. Die behoud van eiendomsreg, holisties gesien, ooreenkomstig die Grondwet van die Republiek;

4.1.4. Om, sonder inperking, bydraes en skenkings te doen tot die Helpende Hand Beursfonds en/of die Solidariteit Helpende Hand NPC;

4.1.5. Om kollektief namens Lede, ondersteuners en die publiek met Owerhede te onderhandel en verhoudinge met Owerhede asook plaaslike, nasionale en internasionale instansies en persone te beding te einde die doelstellings van die Maatskappy te bevorder;

4.2. Die Maatskappy verklaar hiermee die volgende aanvullende doelstellings, maar sonder inperking van die algemene aard van die Maatskappy hoofdoelstellings:

4.2.1. Om as 'n openbare sakewaghond wat fokus op die regte en belange van sy Lede, ondersteuners en lede van die publiek in die algemeen, op te tree;

4.2.2. Om ondersoek in te stel oor gevalle waar die regte van Lede, ondersteuners asook die publiek oor die algemeen, geskend en/of ingeperk word, en om waar nodig ook op te tree ten einde daardie regte te beskerm of te bevorder.

4.3. Die volgende magte word ook, sonder inperking van die algemene magte van die Maatskappy soos uitgeoefen Direksie kragtens die Wet, aan die Maatskappy verleen:

4.3.1. Om deur selfregulering en privaat institusionele infrastruktuur 'n alternatiewe

sake-omgewing te skep waarbinne ekonomiese aktiwiteit voortgesit kan word;

4.3.2. Om die Maatskappy se Lede, ondersteuners en lede van die publiek in die uitoefen van hul belange en regte, hetsy op plaaslike, nasionale of internasionale vlak, by te staan, te adviseer, te ondersteun en/of te verteenwoordig.

4.3.3. Om die publiek oor die algemeen by te staan met die bevordering van hul regte op 'n plaaslike, nasionale en internasionale vlak;

4.3.4. Om 'n vrye, onafhanklike en goedgunstige sake-omgewing in die Republiek te beskerm, stimuleer en waar nodig te skep;

4.3.5. Om regsgedinge in te stel, daartoe toe te tree, om sake te opponeer en/of te verdedig, om as *amicus curiae* in sake op te tree, deel te neem aan appèlle, hersienings, en om voor enige Owerheid te verskyn, submissies te maak, te argumenteer, op te tree, teen te staan en/of te ondersteun.

4.3.6. Om met die Owerhede, politieke partye, lede van die sakewêreld, die media asook enige ander lid van die publiek te kommunikeer, te onderhandel, in te debat te tree en om ook waar nodige daardie persone en/of instansies te voorsien met voorstelle, vertoë, submissies, verslae, argument en/of inligting.

4.3.7. Om navorsing ter bevordering van hierdie doelstellings te doen asook om inligting in te samel, statistiek op te bou, te verwerk en te publiseer;

4.3.8. Om onafhanklike regsadvies oor enige saak wat enige doelstelling van hierdie Akte raak, te bekom en waar nodig om ook regsverteenwoordiging aan te stel om die Maatskappy te verteenwoordig in die bevordering van hierdie doelstellings.

4.3.9. Om met ander organisasies of persone met soortgelyke doelstellings te onderhandel, ooreenkomste te sluit, projekte te hardloop, sake te bevorder, befondsing te voorsien, befondsing te ontvang, ondersteuning te bied en/of te affilieer.

4.3.10. Om deel te neem in die bestuur, beheer of aktiwiteite van enige ander organisasie wat soortgelyke doelstellings as die van die Maatskappy het en om in hulle te belê, belange te bekom en/of om vennootskappe of samewerkingsooreenkomste met hulle aan te gaan.

4.3.11. Om enige persoon of organisasie te vergoed vir hul dienste gelewer aan of

X2

DEPARTMENT OF CO-OPERATIVE GOVERNANCE

NO. R. 1758 **14 February 2022**

DISASTER MANAGEMENT ACT, 2002

EXTENSION OF A NATIONAL STATE OF DISASTER (COVID-19)

I, the Minister of Cooperative Governance and Traditional Affairs, as designated under section 3 of the Disaster Management Act, 2002 (Act No. 57 of 2002) ("the Act"), in terms of section 27(5)(c) of the Act, hereby further extends the national state of disaster that I extended to 15 February 2022 by Government Notice R.1672, published in Government Gazette 45754, to 15 March 2022, taking into account the need to continue augmenting the existing legislation and contingency arrangements undertaken by organs of state to address the impact of the disaster.

NC Zuma

DR NKOSAZANA DLAMINI ZUMA, MP
MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS
DATE: 13 02 2022

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DEPARTMENT OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

NO. 312 **15 MARCH 2020**

DISASTER MANAGEMENT ACT, 2002 (ACT NO 57 of 2002)

CLASSIFICATION OF A NATIONAL DISASTER.

I, Dr Mmaphaka Tau, in my capacity as Head of the National Disaster Management Centre after assessing the potential magnitude and severity of the COVID-19 pandemic in the country, hereby give notice that on 15 March 2020, in terms of section 23(1)(b) of the Disaster Management Act, 2002 (Act No. 57 of 2002) (the Act), classified the COVID-19 pandemic as a national disaster.

Emanating from the classification of this occurrence as a national disaster, in terms of section 26, read with section 23 (8) of the Act, the primary responsibility to coordinate and manage the disaster, in terms of existing legislation and contingency arrangements, is designated to the national executive.

I hereby, in terms of Section 15(2)(*aA*) of the Act, read with section 23(8), call upon organs of state to further strengthen and support the existing structures to implement contingency arrangements and ensure that measures are put in place to enable the national executive to effectively deal with the effects of this disaster.

Also emanating from this classification, and the assistance provided by organs of state in terms of Section 23(8) and Sections 15(2)(*aA*) of the Act, organs of state are required to prepare and submit reports, as required by the National Disaster Management Centre and as outlined in Section 24(4)-(8) of the Act, to the respective intergovernmental forums as listed therein.

Dr Mmaphaka Tau
Head: National Disaster Management Centre
Department of Cooperative Governance
15·03·2020

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DEPARTMENT OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

NO. 313 **15 MARCH 2020**

DISASTER MANAGEMENT ACT, 2002

DECLARATION OF A NATIONAL STATE OF DISASTER

Considering the magnitude and severity of the COVID-19 outbreak which has been declared a global pandemic by the World Health Organisation (WHO) and classified as a national disaster by the Head of the National Disaster Management Centre, and taking into account the need to augment the existing measures undertaken by organs of state to deal with the pandemic, I, Dr Nkosazana Dlamini Zuma, the Minister of Cooperative Governance and Traditional Affairs, as designated under Section 3 of the Disaster Management Act, 2002 (Act No. 57 of 2002) ("the Act"), in terms of -

1) Section 27(1) of the Act, hereby declare a national state of disaster having recognised that special circumstances exist to warrant the declaration of a national state of disaster; and

2) Section 27(2) of the Act may, when required, make regulations or issue directions or authorise the issue of directions concerning the matters listed therein, only to the extent that it is necessary for the purpose of —

   (a) assisting and protecting the public;

   (b) providing relief to the public;

   (c) protecting property;

   (d) preventing or combatting disruption; or

   (e) dealing with the destructive and other effects of the disaster.

NC Zuma

DR NKOSAZANA DLAMINI ZUMA, MP

MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

DATE: 15. 03. 2020.

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COVID-19 / NOVEL CORONAVIRUS

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WHAT IS A NATIONAL STATE OF DISASTER?

These Regulations* are set out to stop the further spread of COVID-19 virus and minimise its effects. Anyone found in violation may be fined or imprisoned.

SUSPENSION OF PUBLIC VISITS TO:

Correctional Centres, Detention Facilities, Holding Cells; Military Detention Facilities; Dep of Social Development facilities for 30 days, may be extended

ALCOHOL

The sale, dispensing or transportation of alcoholic beverages is prohibited between 6pm-9am Mon-Sat; Sun/public holidays 1pm-9am

ECDs

Early Childhood Development Centres, closed 18 March - 15 April 2020, it may be extended

TREATMENT

No person with COVID-19 confirmed or suspected, may refuse medical examination, prophylaxis, treatment, isolation or quarantine

KEEP SOUTH AFRICA HEALTHY

FAKE NEWS

Anyone that creates or spreads fake news about COVID-19 is liable for prosecution

GATHERINGS

Restricted to under 100 people

DEPARTMENT OF DEFENSE

Make available manpower, stores, equipment, ships, aircraft platforms, vehicles & facilities to support government deps, to prevent & manage COVID-19, essential services delivery

AUTHORITY TO ISSUE DIRECTION

...to address, prevent, curb spread of COVID-19 virus by The Ministers of Justice & Correctional Services, Basic & Higher Education, Police, Social Development & others

EMERGENCY PROCUREMENT POLICY

Accounting Officer, Dep of Public Works authorise other Deps to identify & establish quarantine sites; Accounting Officer, Municipality identify appropriate sites; Accounting Officer, Dep of Health procure resources (48hrs), recruit & train professional health workers (24 hrs)

REPUBLIC OF SOUTH AFRICA

The detailed Regulations are available on sacoronavirus.co.za

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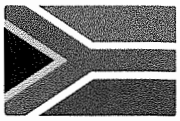

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Parliament welcomes SANDF deployment in battle against Coronavirus Covid-19

24 Mar 2020

The Portfolio Committee on Defence and Military Veterans welcomes the deployment of the South African Defence Force (SANDF) during the 21-day lockdown operations as announced by President Cyril Ramaphosa on Monday, 23 March 2020.

As directed by the President, the SANDF will support the South African Police Service (SAPS) in ensuring that the measures announced to disrupt the chain of transmission of Covid-19 are implemented.

The Chairperson of the committee, Mr Cyril Xaba, said the committee is pleased, and whole-heartedly supports the decision taken by the President. He further draws attention to the importance of supporting the brave men and women who have been mandated with such an enormous task.

Mr Xaba said: "We call on all South Africans to fully cooperate with the directions of our troops. These troops, along with health workers, members of the SAPS, emergency personnel and all those on the list of essential services who will be exempted from the lockdown are serving the country at the risk of their health and their lives to ensure that millions of South Africans are saved from infection.

There are no words to describe the gratitude owed to them, as citizens we need to play our part by fully cooperating with the measures imposed," said Mr Xaba.

The committee extends its appreciation and well wishes to those deployed during the battle against Covid-19.

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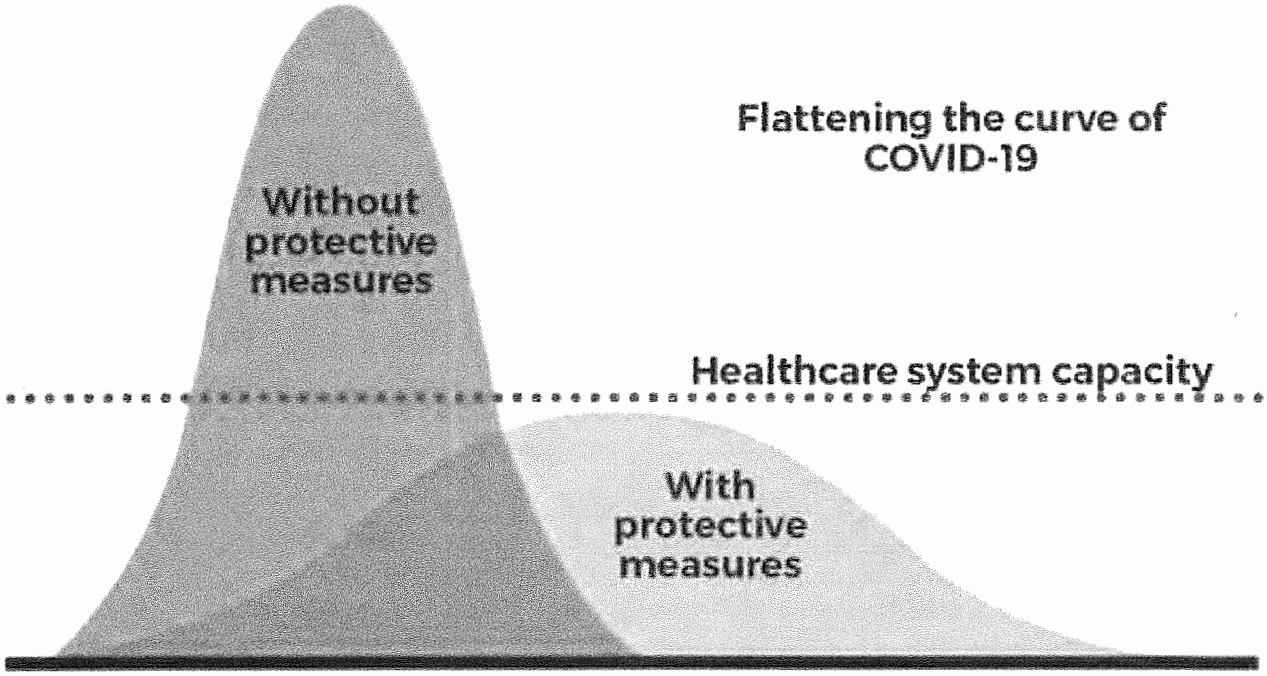
What was the purpose of the lockdown?



The primary purpose of the lockdown was to start to **"flatten the curve"**, preventing a surge of cases in April and May.

The entire country remains at Level 3 to contain the spread of coronavirus

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Health Minister Dr Zweli Mkhize Answers COVID-19 Questions in the National Assembly

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Health Minister Dr Zweli Mkhize Answers COVID-19 Questions in the National Assembly

May 27th, 2020 | Minister Speaks

Health Minister Dr Zweli Mkhize has outlined the criteria which may classify an area as a COVID-19 epidemiological hotspot.

Answering questions in the National Assembly on Wednesday, Mkhize clarified that all districts in South Africa will move to lockdown level three on June 1.

He explained government has taken measures to identify areas that have been defined as epidemiological hotspots. These include any geographic areas which record five or more positive cases of COVID-19 per 100,000 in the population.

cases per 100,000 of the population per geographical area," he said.

"Epidemiological hotspots may occur because of the importation of the COVID-19 virus into geographical areas or due to community transmissions. Epidemiological hotspots require that the monitoring of active cases is undertaken. Epidemiological hotspots may include a ward, a sub-district, a district or a metropolitan region."

Modelling

Several COVID-19 modelling groups have released their estimates publically.

There are three types of modelling: projections which estimate new infections and deaths as well as the resources needed for the response; the interventions if fully implemented that can flatten the curve; and the spatial models which can be used to identify hotspots.

"According to the South African Modelling Consortium, the peak of the infection is expected in mid-July in the pessimistic scenario and mid-August in the optimistic scenario. These models should be considered dynamic and is dependent on new data that comes in. It should only be used as a guide for what may be possible," Mkhize said.

"It is estimated that the number of deaths could range between 34,000 to 50,000. All of these figures have also been challenged by other academics...they are open for debate by those who are specialists in this area...We do believe that the models will improve as time goes in and more raw data is fed into their assumptions."

Religious centres

Centres for worship are among the facilities that will be allowed to open on June 1 – provided they follow strict guidelines.

"We must salute the religious leaders who have embraced the decision to lockdown the country...There will be a number of restrictions that we in our normally daily lives will have to put in place. We take the church and the face based community as partners in

Increased capacity

Mkhize said a team of Cuban doctors have been dispatched to the Western Cape to assist local healthcare workers to prevent the spread of the virus.

"We are very grateful for the support of the Cuban doctors. Over the weekend they were distributed to all the provinces and indeed there is a group of 28 dispatched to the Western Cape. They have been warmly received...They are coming to reinforce the work being done by the team in the Western Cape. This team in the Western Cape is doing their best to try and contain the outbreak," Mkhize said.

"There are constraints in our health system but the President has announced additional resources to assist us to augment the needs we have decided upon. Every province is now increasing the number of beds and putting up field hospitals. We have had additional human resources being employed. 800 nurses have been employed in the Western Cape in the past two weeks, and the Eastern Cape has done the same with just under 1000 nurses."

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New 'Surge Strategy' to battle rising COVID-19 cases

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New 'Surge Strategy' to battle rising COVID-19 cases

Jul 8th, 2020 | Minister Speaks

The National Department of Health has developed, and is currently implementing, what it calls the 'Surge Strategy' in anticipation of the peak of COVID-19 cases in South Africa.

Speaking in the National Assembly on Wednesday, Health Minister Dr Zweli Mkhize says this will ensure that the department increases its capacity for COVID-19, while at the same time continuing to deliver other health services. During this process, the Department repurposed a total of 40,309 hospital beds for COVID-19 as provinces start to experience a sudden increase in their number of cases.

Mkhize said such interventions are only possible because of the nationwide lockdown.

"As a country, we did witness the intended benefits of the lockdown. The delay in the spread of infection allowed us to achieve what we could not have achieved as a country, had we continued in the normal course," he said.

In South Africa's COVID-19 fight so far, almost two million laboratory tests for COVID-19 have been conducted. By the beginning of this month, 139 quarantine facilities have been activated across the country – constituting a total of 12,532 additional beds.

The Community Screening and Testing (CST) Programme initiated in April has ensured that more than 20 million people have been screened and 302,713 suspected cases have been referred for testing.

"Screenings in identified hotspot areas and emerging hotspots show that the CST programme has assisted in active case finding amongst high transmission communities which has allowed our provinces to divert resources to the district or sub-district level," Mkhize said.

However, the problem of healthcare workers testing positive for the virus remains. By the end of June, 4821 healthcare workers were infected.

Mkhize said several interventions have been put in place to address this.

Guidelines to support all health workers across the continuum of care were developed; a targeted training programme has been designed and implemented to enhance the understanding of the pandemic and facilitate application of these guidelines; and in-service training of all health care workers was conducted to ensure that workers can cope with the management of the pandemic.

The Solidarity Fund was able to commit a total R815-million towards procurement of urgently needed PPE's for South Africa's healthcare workers. The country also received generous donations of PPE from several countries, foundations, businesses and churches.

Mkhize said the country now has sufficient PPE stock available to meet the requirements of frontline healthcare workers.

Since the last release of scientific model results in May 2020, the National COVID Epi Model has also been updated to model COVID-19 at a district level, making use of

South African hospitalisation data, updated estimates of the reproductive number, and a shift in testing priorities.

Model projections indicate that while the epidemic is predicted to peak nationally at a similar time to the previously projected optimistic curve (that is mid-August), it does so at a lower level. This means that fewer people were infected in May and June than was previously predicted even under the optimistic scenario.

While the model projects a lower need for hospital (non-ICU) and ICU beds at a national level, bed capacity is still expected to be breached or overwhelmed in all provinces.

The Department of Health is working with the Department of Trade and Industry and Competition to manufacture Continuous Positive Air Pressure (CPAP) devices. These are being procured on top of the 1000 ventilators donated by the US government.

The Department of Health has built several field hospitals, which will primarily be used for admission of mild cases. The Western Cape has completed constructing three field hospitals which are functional. Gauteng (NASREC), KwaZulu-Natal (Pietermaritzburg) and Eastern Cape (Port Elizabeth, VW) each have one field hospital which are also operational.

"The Department is working with the National Treasury and partners to conduct an audit of the oxygen reticulation infrastructure in all our hospitals. These audits are being conducted with a priority focus on the Eastern Cape, KwaZulu-Natal and Gauteng," Mkhize said.

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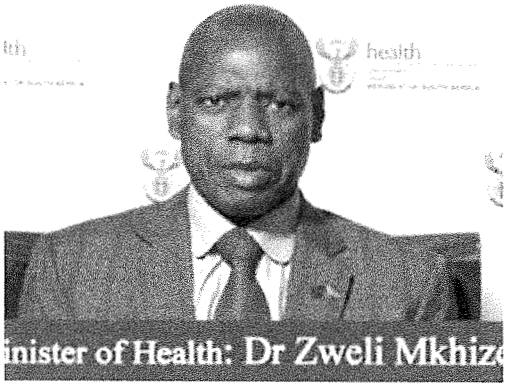

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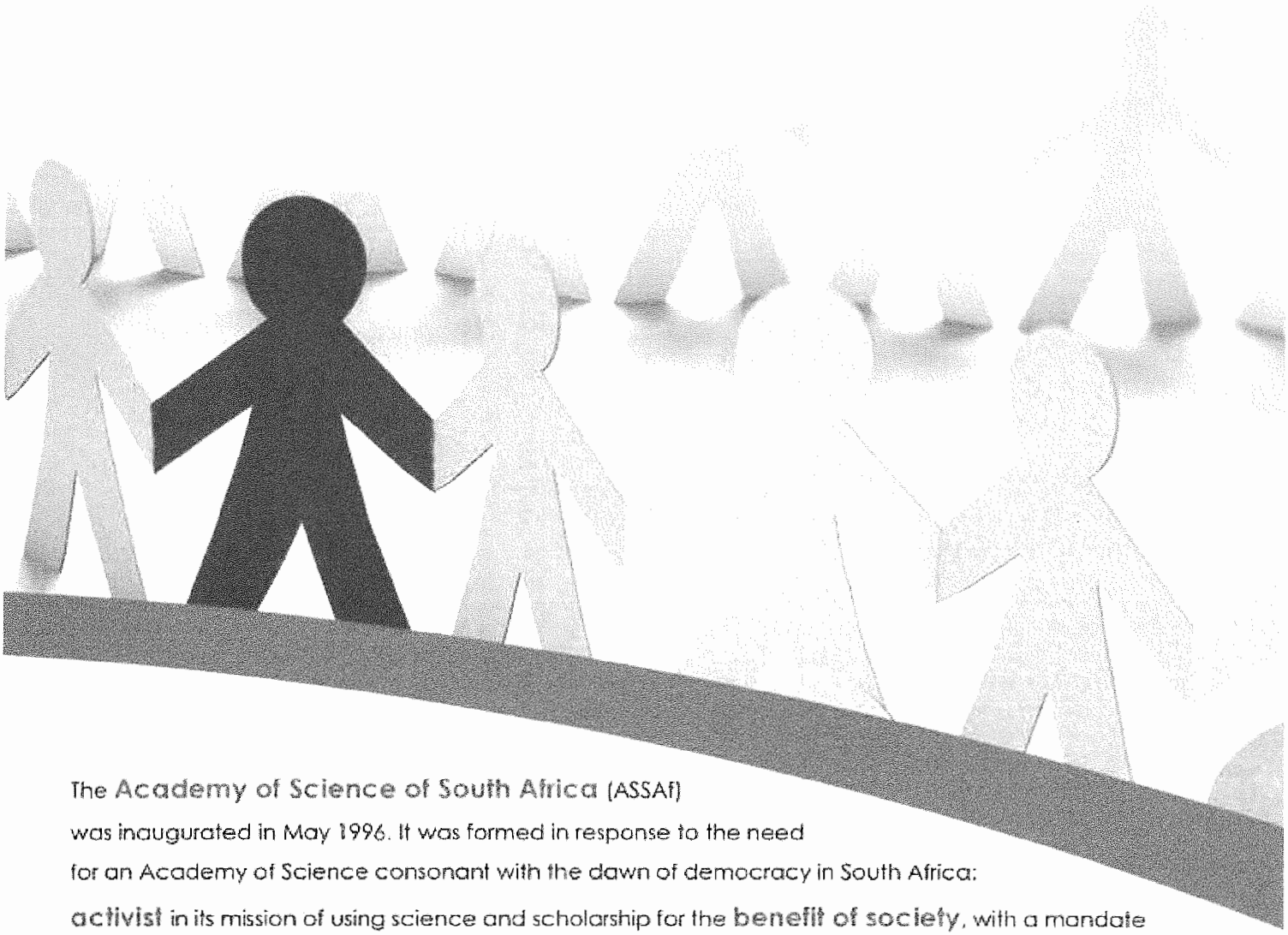
Applying scientific thinking in the service of society



The **Academy of Science of South Africa** (ASSAf) was inaugurated in May 1996. It was formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa: **activist** in its mission of using science and scholarship for the **benefit of society**, with a mandate encompassing all scholarly disciplines that use an **open-minded** and **evidence-based** approach to build **knowledge**. ASSAf thus adopted in its name the term 'science' in the singular as reflecting a common way of enquiring rather than an aggregation of different disciplines. Its Members are elected on the basis of a combination of two principal criteria, **academic excellence** and **significant contributions to society**.

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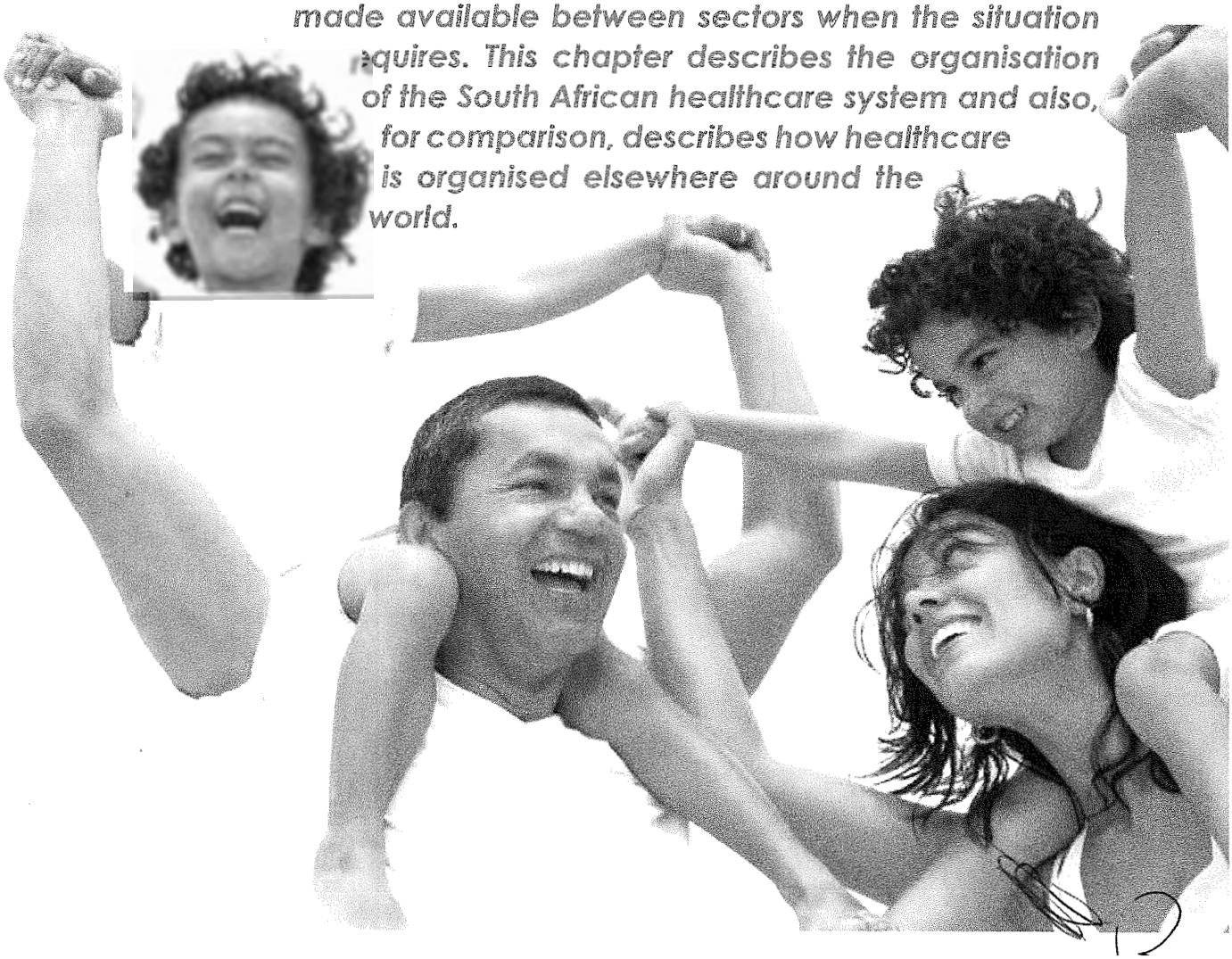
CHAPTER 9

The South African Healthcare System and Covid-19

South Africa has a dual healthcare system. For the majority of South Africans, healthcare is provided for by the state, through the national, provincial and local healthcare systems. Healthcare is provided at tertiary (academic teaching hospitals, for example Groote Schuur, Tygerberg, King Edward VIII and Baragwanath teaching hospitals), secondary and regional hospitals and local clinics. A parallel private healthcare system is based on an insurance scheme and is funded by medical schemes (such as the Discovery Health). Private healthcare is available to more affluent South Africans able to pay the premiums for these schemes. All systems are regulated by the Health Ministry. The state system is overstretched and struggles to provide adequate healthcare for the majority of South Africans unable to afford medical insurance. The coronavirus pandemic has aggravated this situation. A further development during the pandemic is the public-private healthcare mix in which beds were made available between sectors when the situation requires. This chapter describes the organisation of the South African healthcare system and also, for comparison, describes how healthcare is organised elsewhere around the world.



This chapter provides an overview of the South African healthcare system explaining how key features of this system have both supported or detracted from an effective response to the Covid-19 pandemic. The South African health system may be divided broadly into four parts, three of which are governmental and one of which is private. The national, provincial, and local governments work together to deliver health service. The national government defines a national policy and oversees its implementation. The provincial government has the constitutional mandate for health services held concurrently with the national sphere. Finally, local governments have a mandate for health functions not involving clinical healthcare services, including environmental health, sanitation, and aspects of population health.

The fourth part of the health system consists of private healthcare providers and is funded by private health insurance (referred to as 'medical schemes'). This private sector is, however, also governmentally regulated, mainly through national legislation falling under the jurisdiction of the Minister of Health. All health professionals, medicines, medical products, medical devices, pharmacies, and medical schemes are regulated. A regulator, the Council for Medical Schemes, which reports to the Minister of Health, supervises medical schemes. Private hospital licensing, however, occurs at a provincial level (Figure 9.1).

The emergence of provincial governments and medical schemes as the predominant vehicles for the delivery of health services in South Africa is an outcome of the incremental interplay between the changing needs of the population and policy over a period of 200 years. The present institutional context is, consequently, quite entrenched.

Financing the health system

The public health system can be divided into five elements: general government (national and provincial); local authorities; the health system of the national defence force; social insurance arrangements (compensation for occupational injuries and diseases, compensation for occupational diseases affecting mineworkers, and the Road Accident Fund); and subsidies to medical scheme members. The focus of this section is on the main elements: the financing of publicly delivered services through national, provincial and local government structures; and the private health system funded by medical schemes.

The Constitution broadly establishes a multi-level general government system, with significant autonomy allocated to the three spheres of Government. While the system is subject to continuous legislative development, which influences the distribution of functions and the relative degrees of autonomy, broadly speaking the financial architecture of the South African public system corresponds to what is termed 'fiscal federalism'.

The bulk of government revenue is raised through national taxes and allocated to national, provincial and local government through the Division of Revenue Act (DORA). The allocations to national departments by the National Legislature take the form of voted budget allocations. The voted allocations to both provincial and local governments, however, become revenue for these structures. Their legislative structures subsequently vote on final allocations, taking account of both their own revenue sources and that derived from national government. (See Figure 9.2 for an illustration of the flows).

Transfers from national government take two basic forms: a formula-based unallocated block grant, which provides general revenue to both provincial and local authorities; and conditional allocations, which, where required, seek to achieve convergence between national, provincial and local governments. These allocations and the relevant conditions are specified in the DORA each year. Provincial governments, in particular the health function, provide subsidies to local authorities to render services falling within the functional responsibilities of the province.

In this system, each sphere of government is able to receive funds as revenue from their own taxes, user fees and inter-governmental transfers. While revenue transfers can technically go in any direction, to date they tend to flow from the higher sphere to lower spheres.

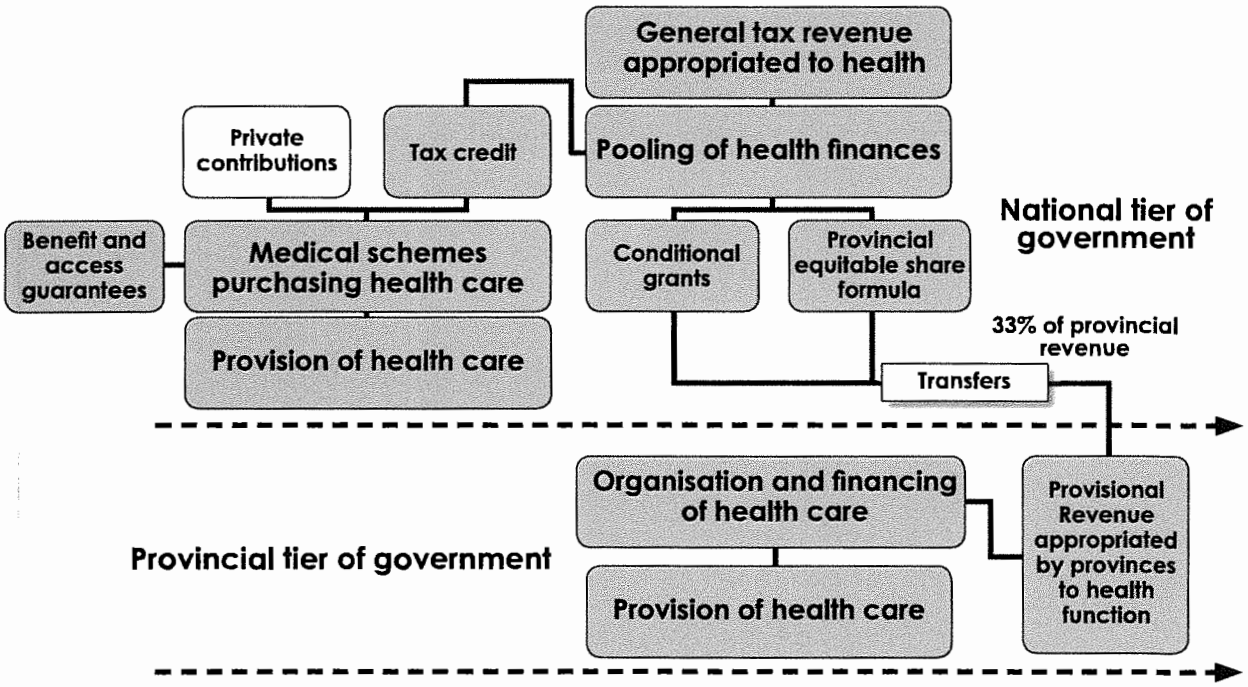


Figure 9.1: High-level overview of South Africa's present universal health coverage framework.
Credit: Alex van den Heever

The distribution of national government expenditure is heavily weighted to national government and the provinces, which was at 47.7% and 43.3%, respectively, in 2018. Local government only received around 9% in 2018, with most of their budgets financed through their own taxes, utility fees and transfers from provincial governments.

For provinces, the formula-allocated unconditional provincial equitable share grant (PES) accounts for the bulk of their revenue, which was 82.4% of the national allocation in 2018. Conditional grants, the largest share of which are for health functions, stood at 17.6% of their nationally sourced revenue in 2018. Overall, the national allocation to provinces came to R571 billion in 2018.

National revenue flowing to local government is made up of three transfers: the unallocated local government equitable share grant (53.0% in 2018); conditional grants (much of which is for the health function) (36.5% in 2018); and a distribution of the revenue raised from the fuel levy (10.5% in 2018). In 2018, the overall allocation to local governments from national government amounted to R118.5 billion.

The largest conditional grants relating to the health function for expenditure in 2018 were the Comprehensive HIV, AIDS and Tuberculosis Grant at R19.9 billion; the National Tertiary Services Grant (NTSG) at R12.4 billion; and the Health Professions

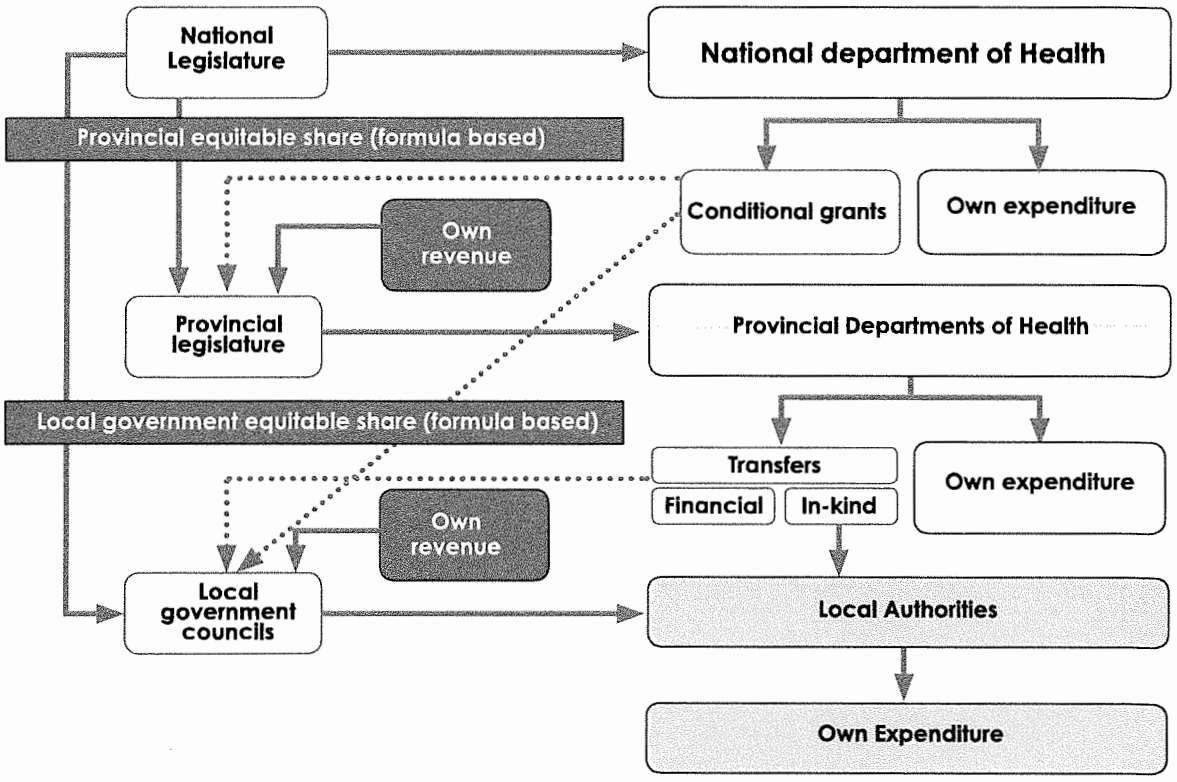


Figure 9.2: Organisation of public health financial flows–revenue and expenditure.
Credit: Alex van den Heever

Training and Development Grant (HPTDG) at R2.8 billion. Capital transfers in 2018 for the Health Facilities Revitalisation Grant involved an additional R5.8 billion. In total, health conditional grants in 2018 came to R35.3 billion.

Two conditional grants are of particular importance for the provinces of Gauteng and the Western Cape. These are: the NTSG, which theoretically funds cross-boundary flows from other provinces for the use of highly specialised services concentrated in these provinces; and the HPTDG, which theoretically funds the additional costs to the health service for the teaching and research functions carried out by academic complexes concentrated in these provinces. In the absence of these grants, both these provinces would be unable to sustain their more complex services and educational functions.

The relationship between these grants and the services they are supposed to fund has never been built into the funding model and both the provincial and national departments appear to lack the capacity to properly negotiate the values and specificity of the grants. Despite numerous reviews by the Financial and Fiscal Commission, culminating in a published report in 2006 (van den Heever, Nthite, & Khumalo, 2006), no changes have been made to the grant designs. Due to the failure to adjust these grants, or provinces to properly negotiate their value, both the Western Cape and Gauteng are likely to face growing financial constraints in maintaining their highly specialised services over the next ten years.

The public-private mix

When expressed as a percentage of Gross Domestic Product (GDP), public and private health system expenditures have remained relatively stable over a long period. However, both the public health systems and medical schemes saw a structural increase from 2.8% and 3.2%, respectively, in 2000 to 3.9% and 3.9%, respectively, in 2018. Out-of-pocket expenditure, at least as reflected by the World Health Organisation, stood at an estimated 0.6% of GDP in 2014 (World Health Organisation, 1995 to 2014), which is fairly good by international standards.

While the expenditure trends have remained stable and rising, the populations served by the two systems have not. Dramatic cost increases in the medical schemes system appear to have constrained increases to below overall population increase (a drop from 19.8% of the total population in the late 1990s to around 16% at present), with the public sector catchment population increasing slightly faster. By 2018 the public sector needed to protect 48 million people while medical schemes offered coverage to 8.9 million people (Table 9.1).

While the amount spent on the private sector via medical schemes has remained fairly constant (as a percentage of GDP) over time, there has been a dramatic shift in hospital services away from the public sector.

Until 1986, most people covered by medical schemes purchased their hospital services from the public sector, as higher-income groups and medical scheme members have always needed to pay for public hospital services. From 1986 to 2010, the number of private acute hospital beds in the private sector increased from 6,125 to 31,067, while beds in the public sector declined from 117,842 to 88,920 (Table 9.2). In the period after 2000, the public sector explicitly de-prioritised hospital-based services in favour of primary care-or district health services. Within the public health budget, there has also been a substantial diversion of resources to HIV and AIDS funding.

Table 9.1: Health expenditure in South Africa from 2000 to 2018

	2000	2005	2010	2015	2016	2017	2018
Public health compared to medical schemes expenditure (2018 prices)							
Public health	75 913	102 094	157 255	183 090	185 529	191 167	197 142
Medical schemes	84 471	119 915	154 792	178 423	181 462	189 384	193 332
Total	**160 384**	**222 009**	**312 047**	**361 513**	**366 991**	**380 551**	**390 475**
Catchment populations for the public and medical schemes sectors							
Public health	32 119	36 140	39 566	44 555	45 648	46 832	48 030
Medical schemes	6 454	6 836	8 316	8 792	8 865	8 872	8 891
Total	**38 573**	**42 976**	**47 882**	**53 347**	**54 513**	**55 704**	**56 922**
Public health compared to medical schemes expenditure: % of GDP							
Public health	2.8%	3.0%	3.7%	3.8%	3.8%	3.9%	3.9%
Medical schemes	3.2%	3.5%	3.6%	3.7%	3.7%	3.9%	3.9%
Total	6.0%	6.5%	7.4%	7.5%	7.5%	7.8%	7.8%
Public health compared to medical schemes expenditure: Per capita (2018 prices)							
Public health	2 364	2 825	3 975	4 109	4 064	4 082	4 105
Medical schemes	13 087	17 543	18 614	20 293	20 470	21 346	21 744
National average	**4 158**	**5 166**	**6 517**	**6 777**	**6 732**	**6 832**	**6 860**

Source: Alex van den Heever

The South African hospital system

The public sector presently has 86,579 usable beds, down from the 88,920 beds in 2010, as shown in Table 9.2. Of these, 30,265 are district hospital beds; 9,086 are central (academic) hospital beds; 5,810 are provincial tertiary hospital beds; and 24,096 are regional hospital beds (see Table 9.3 for the public hospital definitions). Overall, this implies a bed to 1,000 population ratio (public sector) of 1.8. This is not too far off from (national) country comparators such as Chile (2.1), Brazil (2.3), United Kingdom (2.6), with most countries also showing a downward trend over time. It is, however, significantly lower than the ratio of 4.4, corresponding to the private sector medical schemes population.

Table 9.2: Private and public hospital and bed estimates (from 1976 to 2010)

YEAR	PRIVATE		PUBLIC	
	Hospitals	Beds	Hospitals	Beds
1976	25	2,346		
1986	65	6,125 (est)		117,842 (est)
1989	101	10,936		
1998	162	20,908	343	107,634
2010	216	31,067	410	88,920

Source: Alex van den Heever, 2012

Strategic decisions regarding the direction of public hospital beds are made by provinces and are subject to their specific constraints without regard to an explicit national policy framework. Although it would be possible for national government, via the National Department of Health, to use conditional grant allocations to achieve such an alignment, options along these lines have not been exercised to date, despite recommendations to do so by the Financial and Fiscal Commission (van den Heever et al., 2006).

Table 9.3: Public sector hospital types

Hospital type	Description
Central hospitals (academic)	Hospitals with teaching responsibilities containing a high concentration of subspecialist services. These hospitals serve populations beyond the province in which they are located.
Provincial tertiary hospitals	Hospitals with little or no teaching responsibilities that contain subspecialist services, but which only serve the province in which they are located and can draw patients from the entire province.
Regional hospitals	Hospitals with a strong focus on general specialisations such as obstetrics and gynaecology, paediatrics, and orthopaedics and only serve the provinces in which they are located.
Psychiatric hospitals (acute)	Acute psychiatric hospitals offer specialised psychiatric care beyond the provinces in which they are located.
Specialised hospitals	Include mainly rehabilitation and infectious disease hospitals.
Tuberculosis (TB) hospitals	Due to the high incidence of TB in South Africa, the public system offers an extensive system of TB hospitals. While the principal focus is on ordinary TB cases, they must increasingly cater for various forms of drug resistant TB.
Specialised chronic hospitals	Long-term chronic psychiatric care has typically been offered in either public facilities or contracted private facilities.

Source: Alex van den Heever

Although some private hospitals are specialised (e.g. maternity, psychiatric, day, etc.), many are general hospitals with a mix of specialisations available. Data on private hospitals is, however, not routinely published by either the public or private sector, with information often available only from unverifiable proprietary data sources. However, data is available on request from various hospital groups and associations. Based on these sources, a dataset has been compiled by the author. The estimates for 2016 (and broadly consistent with 2020) by bed type are provided in Figure 9.4.

Hospital systems response to the COVID-19 pandemic

An important concern with respect to the COVID-19 outbreak in South Africa was whether the hospital system as a whole could accommodate the peak demand for critical care beds. By the time the first cases were detected in South Africa in March 2020, it had become clear that a consistent proportion of infected individuals become so severely ill that they require access to critical care services. In particular, a need arises for intensive nurse supervision, oxygen, and, in case of further deterioration, ventilation. Ventilation is typically only available to intensive care unit (ICU) beds. The ICU bed count, therefore, serves as an approximate proxy for the availability of ventilators.

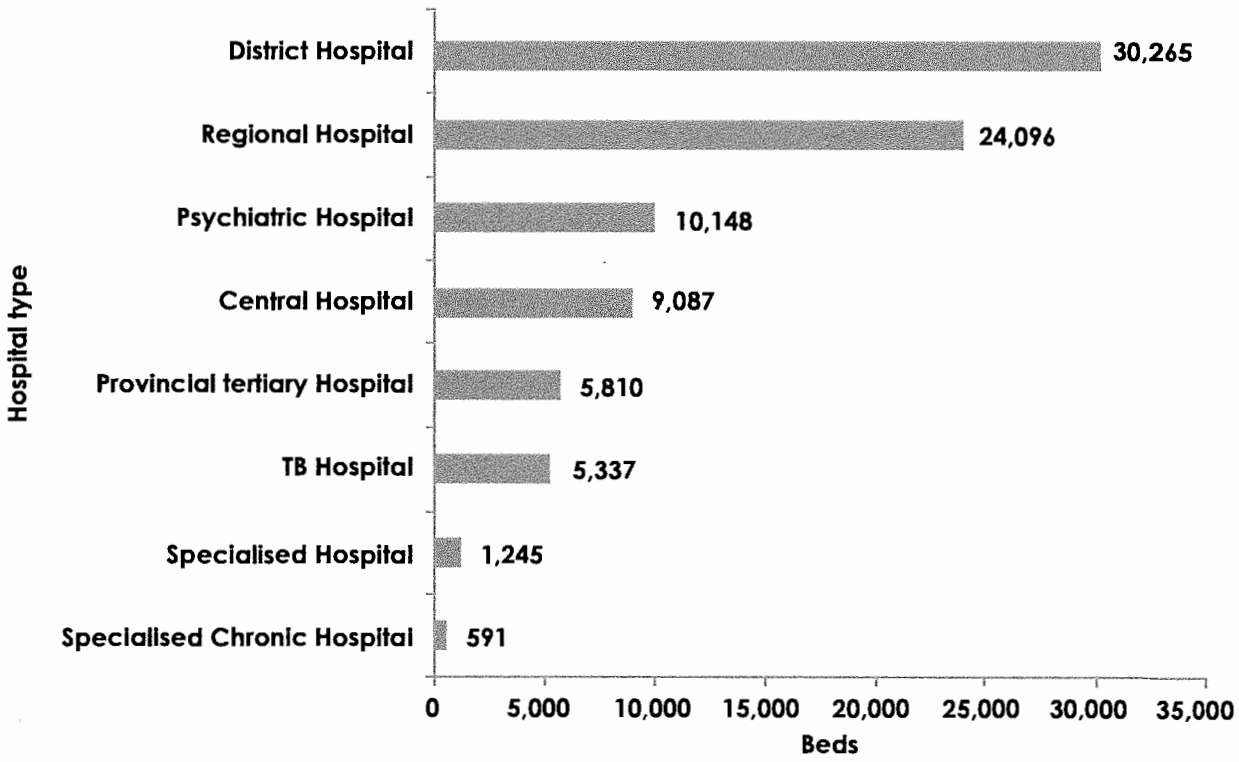


Figure 9.3: Public hospital beds by type of facility--usable beds in 2013
Source: Based on (National Department of Health, 2013). Credit: Alex van den Heever

While South Africa's overall bed levels appeared sufficient to cope with less severe admissions, it was initially unclear whether sufficient critical care beds, and especially ventilators, would be available to cope with peak demand.

Without accounting for occupancy for non-Covid-19 cases, at the beginning of the outbreak in March 2020, South Africa had roughly 93,295 acute care beds available in private acute care facilities (41,954) and in public regional, tertiary, and academic hospitals (51,341). The total number of ICU beds (i.e., those potentially with ventilators) stood at 3,318, with 2,140 in the private sector and 1,178 in the public sector. High care beds, which have similar nurse intensity to ICU beds and access to oxygen but not necessarily ventilators, stood at around 2,722 in March 2020, with 1,640 in the private sector and 1,082 in the public sector (Table 9.5).

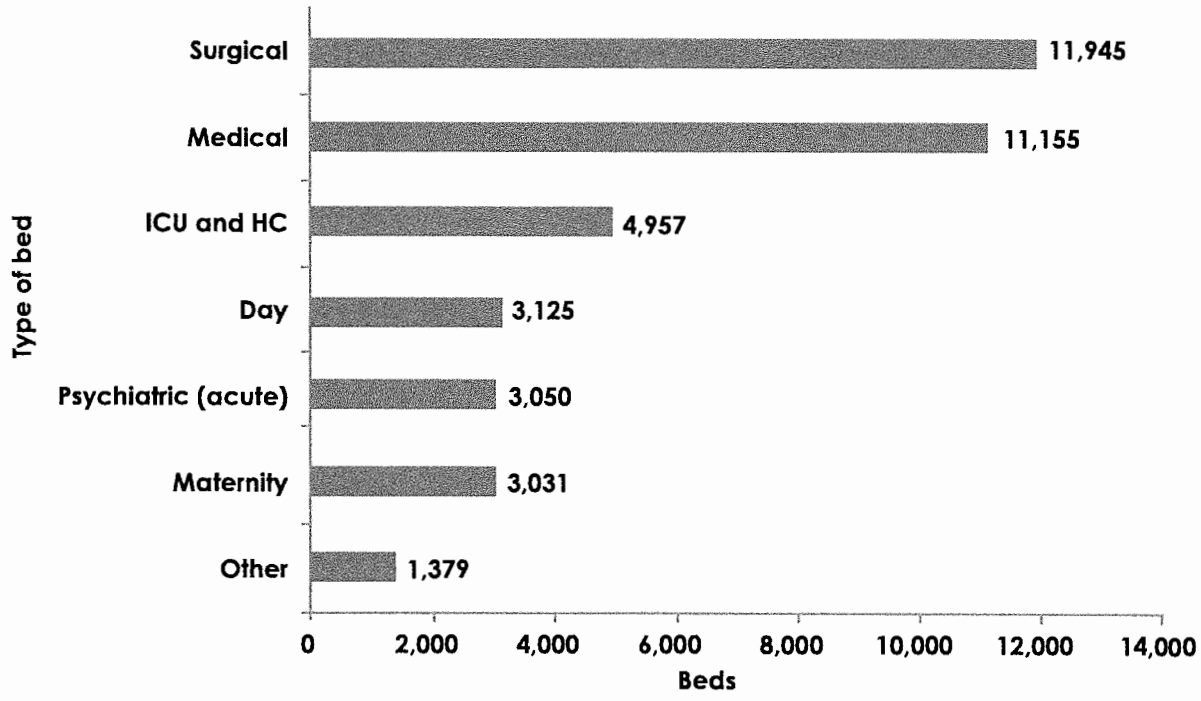


Figure 9.4: Private sector hospital beds by bed type (2016 estimate)
Source: Alex van den Heever, 2018

Table 9.5: Acute bed availability in the South African health system in March 2020

Sector	Province	Acute beds	Total critical care	ICU beds	HC beds
Private	EC	2 145	159	93	66
	FS	2 708	310	114	196
	GP	18 094	1 871	1 132	739
	KZN	6 152	516	305	211
	LP	741	44	28	16
	MP	1 846	97	63	34
	NC	918	34	27	7
	NW	2 230	197	87	110
	WC	7 119	552	291	261
Private Total		**41 954**	**3 780**	**2 140**	**1 640**
Public (regional, tertiary and academic)	EC	6 029	241	110	131
	FS	3 394	184	109	75
	GT	13 170	819	330	489
	KZ	13 097	386	273	113
	LP	3 501	69	34	35
	MP	1 579	51	25	26
	NC	929	34	21	13
	NW	3 251	81	54	27
	WC	6 391	395	222	173
Public Total		**51 341**	**2 260**	**1 178**	**1 082**
Grand Total		**93 295**	**6 040**	**3 318**	**2 722**

Source: Data from (National Department of Health, 2013; Alex van den Heever, 2018)

While some attempts were made to expand capacity to deal with the peak periods of demand through the construction of field hospitals, there is no evidence that the number of staffed beds changed significantly during the peak demand periods (July/August 2020). The highest recorded number of Covid-19 admissions to both the public and private sectors occurred on 1 August 2020, with total admissions at 8,310, of which 1,520 required critical care (National Institute of Communicable Diseases, 2020). Of those requiring critical care, 799 required ventilation. While there is some question regarding the accuracy of Covid-19 admissions in public hospitals outside of the Western Cape and the private sector, these numbers appear broadly consistent with the tracked new infections. Total Covid-19 admissions, therefore, never exceeded the combined capacity of the public and private systems, even after accounting for non-Covid-19 occupancy. Many hospitals in both the public and private sectors cancelled elective surgery from April through to August to ensure that critical care beds would be available for Covid-19 patients.

Out of all the provinces, only the Western Cape entered into an agreement with the private sector to access critical care beds if required. Ultimately, the agreement was not required as access to oxygen was expanded within the public sector and only a small number of public patients accessed private beds in the Western Cape.

Comparative healthcare systems

Having described the current healthcare system in South Africa, we now turn to describing briefly some of the different ways in which healthcare is organised elsewhere around the world.

Most of Europe, the United Kingdom, Canada, and a number of other countries have what is often described as 'universal healthcare', where everybody is able to access more or less the same services without distinction. The precise details of the organisation differ considerably from country to country, but the end result is much the same. The United Kingdom, for example, has a general tax-funded system, where doctors and hospitals are reimbursed directly for their services by local trusts (government organised decentralised purchasing units) using funds raised through taxes. In France, as another example, doctors and hospitals are in part reimbursed through the government, or the Sécurité Sociale, and in part by supplemental insurance whose terms are largely defined by legislation, with minimal co-payments by the patient. The system is set up so that everyone receives largely the same basic coverage. The organisation of services (often referred to as purchasing) is organised largely at local levels. In Germany, the Netherlands and Belgium, purchasing occurs

A number of countries have what is often described as 'universal healthcare', where everybody is able to access more or less the same services without distinction.

through regulated markets by private mutual funds supported by government pooling mechanisms (to account for differences in income and the need for health services).

In other countries, most notably the United States, healthcare is largely organised by less regulated private markets for insurance and healthcare provision. Social insurance arrangements involve Medicare, which provides healthcare to low-income groups, and Medicaid, which provides coverage to people over the age of 65. For people falling outside of the means test for Medicare and below the age of 65, coverage is precarious if not part of a group health insurance arrangement offered through an employer. The end result is highly unequal access to healthcare and, also, substantial inequality in quality of the healthcare received. While the United States leads the world by far in spending per capita on healthcare, the indicators of the results do not lead the world. For example, infant mortality (defined as dying before the age of one year) is 5.9 per 1000 live births in the US, whereas the corresponding figures for a sampling of other countries are as follows: 2.2 in Japan; 3.1 in Germany; 3.3 in France; 11.65 in China; 38 in South Africa; and 76 in Nigeria.

Life expectancy provides another useful performance indicator. Here are some numbers from a few selected countries:

Hong Kong	**84.7**
Japan	**84.5**
Italy	**83.6**
France	**82.5**
UK	**81.2**
Costa Rica	**80.1**
US	**78.9**
Cuba	**78.6**
Mexico	**75.0**
China	**72.9**
Russia	**72.4**
Rwanda	**68.7**
India	**69.4**
Senegal	**67.7**
South Africa	**63.9**
Zimbabwe	**61.2**
Nigeria	**54.3**
Central African Republic	**52.8**

Source: United Nations

Currently, a vigorous debate is taking place in the United States on how best to organise healthcare, with some advocating a system closer to the European model and others advocating maintaining the status quo. Former US President Barack Obama implemented reforms, expanding coverage to individuals falling outside of employer-based group coverage. The current debate centres on expanding Medicaid to provide default coverage for people unable to access proper insurance coverage through voluntary health insurance arrangements. Unregulated voluntary health insurance markets structurally fail to provide proper coverage to people with pre-existing medical conditions and those with inadequate incomes. Opposition to an expansion of Medicaid comes from private commercial health insurers, who would lose significant business to public coverage. Healthcare was one of the key issues of the 2020 US presidential election.

Throughout the world, how to organise healthcare will continue to be a vigorous subject of debate.

Many third world countries have a hybrid system with a minimal public offering for the majority at no or minimal charge, and another parallel private system for the middle and upper classes, which is financed by insurance premiums for those who can afford them.

Throughout the world, how to organise healthcare will continue to be a vigorous subject of debate. As a general trend, healthcare costs are rising faster than inflation as new treatments are becoming available. Another challenge is the inequality with urban and rural areas, which have a lack of doctors and less advanced care.

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The Academy of Science of South Africa (ASSAf) was inaugurated in May 1996. It was formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa: activist in its mission of using science and scholarship for the benefit of society, with a mandate encompassing all scholarly disciplines that use an open-minded and evidence-based approach to build knowledge. ASSAf thus adopted in its name the term 'science' in the singular as reflecting a common way of enquiring rather than an aggregation of different disciplines. Its Members are elected on the basis of a combination of two principal criteria - academic excellence and significant contributions to society.

The Parliament of South Africa passed the Academy of Science of South Africa Act (No 67 of 2001), which came into force on 15 May 2002. This made ASSAf the only academy of science in South Africa officially recognised by government and representing the country in the international community of science academies and elsewhere.

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2021

Essential facts about Covid-19: the disease, the responses, and an uncertain future. For South African learners, teachers, and the general public

Bucher, Martin (ed)

Academy of Science of South Africa (ASSAf)

X12

Estimating cases for COVID-19 in South Africa

Long-term national projections

Report Update: 6 May 2020

FOR PUBLIC RELEASE

Prepared by MASHA, HE²RO, and SACEMA

on behalf of the South African COVID-19 Modelling Consortium

Please address all queries and comments to: Harry Moultrie at HarryM@nicd.ac.za

The projections in this report are intended for planning purposes by the South African government.

COVID-19 is a new infectious disease. There is much still unknown about how the disease works, and how it will progress in the South African context. The South African COVID-19 Modelling Consortium was established to project the spread of the disease to support policy and planning in South Africa over the coming months.

Due to the rapidly changing nature of the outbreak globally and in South Africa, the projections are updated regularly as new data become available. As such, projections should be interpreted with caution. Changes in testing policy, contact tracing, and hospitalisation criteria will all impact the cases detected and treated as well as the required budget for the COVID-19 response in the next six months.

The model projects that by 1 June, under the optimistic scenario, detected cases are expected to rise to between 10,702 and 24,781 depending on availability of testing and the effectiveness of the post-lockdown. The cumulative number of deaths by 1 June is expected to be between 112 and 940.

The lockdown is anticipated to have flattened the curve and delayed the peak by 2 to 3 months, depending on the strength of the public's adherence to the lockdown and social distancing measures. In the coming weeks, we will be able to estimate more accurately what the effect has been.

South Africa is likely to see a peak demand for hospital and ICU beds between August and September. However, based on current resource levels, model projections indicate that the number of available hospital and ICU beds will likely be exhausted by July. The NDOH's COVID-19 budget will be between 10 and 15 billion rand and as such is affordable under the 20 billion rand budget allocation for the medical COVID-19 response.

Executive summary

The purpose of this report is to project estimated COVID-19 cases at national and provincial levels for the next six months. A mathematical model was used to simulate the transmission of local and imported COVID-19 cases based on data regarding laboratory confirmed infections until 30 April 2020 and using parameter estimates jointly agreed upon by the SA COVID-19 Modelling Consortium.

The model projects that by 1 June 2020, detected cases are expected to have risen to 15,817 (10,702, 24,781) in the optimistic scenario and 76,106 (44,955, 129,884) in the pessimistic scenario based on the availability of testing and effectiveness of the lockdown. The cumulative number of deaths by 1 June is expected to be between 112 and 940. The range of uncertainty grows with each month, with an estimated 3.4-3.7 million laboratory-confirmed cases by 1 November, with the number of deaths expected to be between 34,015 and 49,774. The required total budget for the national and provincial departments of health will be between 26

and 32 billion rand over the next 6 months, of which between 10 and 15 billion rand will accrue to the National Department of Health (NDOH). This budget covers personal protective equipment, the cost of additional ICU and hospital beds and staff, additional PHC staff, ventilators, drugs, isolation facilities, testing and surveillance and Port Health budgets. The NDOH portion of the budget is affordable under the 20 billion rand budget allocation for the medical COVID-19 response. **These projections are subject to considerable uncertainty and variability. Estimates will change and improve as the epidemic progresses and new data become available.** ICU and hospital bed numbers are to be interpreted with caution as severity of disease is yet to be contextualised to South Africa, and admission to ICU is likely to be subject to stricter criteria than globally. Nevertheless, model projections indicate that the number of available hospital and ICU beds will likely be exhausted by July, possibly increasing the death rate beyond what is projected here.

As updated testing and hospital data become available, the models can be calibrated to provide more robust predictions.

Due to the rapidly changing nature of the outbreak globally and in South Africa, the projections will need to be updated regularly and should be interpreted with caution. Changes in testing policy, contact tracing, and hospitalisation criteria will all impact the cases detected and treated in the next six months. The models have been developed using data that is subject to a high degree of uncertainty. Transmission has been modelled at national and provincial levels resulting in model predictions providing broad-stroke national/provincial guidance rather than informing strategy at a more granular level. All models are simplifications of reality that are designed to describe and predict system behaviour and are justified by the assumptions and data with which they are developed.

About the South African COVID-19 Modelling Consortium

The South African COVID-19 Modelling Consortium is group of researchers from academic, non-profit, and government institutions across South Africa. The group is coordinated by the National Institute for Communicable Diseases, on behalf of the National Department of Health. The mandate of the group is to provide, assess and validate model projections to be used for planning purposes by the Government of South Africa. For more information, please contact Dr Harry Moultrie (harrym@nicd.ac.za).

Context for interpreting projections

The results presented below must be interpreted carefully and considering the following points of additional context:

Not all COVID-19 infections will be detected. Infected individuals who are asymptomatic are not likely to seek out a diagnostic test. Additionally, with laboratory and testing constraints, it is not always possible to test all individuals who seek laboratory confirmation. A meeting of epidemiologists was convened at the NICD to estimate the number of cases active in the population that were not being detected. The number of confirmed COVID-19 cases, evolution of patient under investigation criteria for COVID-19 testing, the number of contacts identified and proportion traced, and publications/reports on under-detection rates in other countries were reviewed. It was concluded that all hospitalised severe and critically ill cases would be detected while only 1 in 4 mildly ill cases would be detected. This inflation factor is applied in the model projections. The true value is unknown and is likely to vary through time. For example, it is likely that with a scale-up in testing and laboratory facilities this inflation factor will go down. The estimate may be revised for future projections. Serosurveillance studies are being planned to provide more robust estimates.

Projections at the population level do not capture local clustering of cases. The methods used in this report make simplifying assumptions regarding how contacts between infectious and uninfected people occur and assume that mixing is random at the provincial level. The models therefore cannot capture the differences in risk experienced by some members of society – e.g. health care workers or those living in close, confined quarters such as prisons – nor can it capture the effects of specific events – e.g. religious gatherings and funerals – on local transmission.

Models project total need for hospital and ICU beds. As currently formulated, the model assumes that hospital resources, including availability of general ward and ICU beds, staff, and ventilators, will be able to meet demand. This approach is intended to demonstrate the system-wide need for these resources. In reality, the demand for these resources is expected to exceed capacity. The effect, in particular on mortality, of not being able to meet ICU and ventilator demand is not taken into account in the model, nor are the effects of any rationing of these resources.

Estimating mortality due to COVID-19. There is considerable uncertainty when projecting mortality due to COVID-19 using mathematical models. At this early stage of the epidemic, it is unclear what proportion of people who become infected will die as well as precisely how many people will become infected over the course of the epidemic. It is also unclear how risk factors such as HIV, TB, and non-communicable diseases will impact COVID-19 mortality in South Africa. In the model presented here, mortality has been projected using age-specific mortality from the Chinese epidemic adapted to the South African population.

It is particularly important to note that the projections over a six month period for South Africa cannot be compared to *current* mortality in other COVID-19 affected countries, as mortality would have been observed for at most three months in those countries. All countries are currently in the early phase of their epidemics, with resurgence expected in the coming months. Current model projections track observed mortality in South Africa estimating 2 deaths per million population by 4 May 2020. This rate falls below countries such as Algeria (11 per million) and Egypt (4 per million) on the same date (https://www.worldometers.info/coronavirus/). The mortality and case projections are also determined on the assumption that social distancing will continue after the 5-week lockdown. New national and/or geographically targeted interventions will impact the expected deaths due to COVID-19.

Models do not account for population-wide behaviour changes in response to high levels of mortality. The projections provided in this document are based on an assumption that after the lifting of hard lockdown measures, level four restrictions are assumed to be in place for one month following which social distancing will continue at a moderate level, reducing transmission by 10-20%. No further responses to the epidemic are incorporated, either government-imposed measures such as lockdowns or natural behavioural changes induced by the severity the epidemic. In recent epidemics of severe disease, including the Ebola epidemic in West Africa, the population's response to high local mortality has played an important role in reducing the rate of epidemic growth and the ultimate number of infections and deaths. Similar dynamics have likely contributed to the decline of severe COVID-19 epidemics in countries such as Spain and Italy. The extent to which population-wide behavioural changes may influence the spread of the epidemic in South Africa, or how these changes may vary across the population, are unknown and not taken into account in the projections provided in this report.

Projections will improve with new data. At the time of this report, very limited data are available beyond the number of new cases confirmed through time at the national and provincial level. Additional data, in particular health system utilization data such as numbers of hospitalizations occurring in different geographic areas and duration of stay for patients requiring different types of care, will be required to further refine the model and tune it to the South African context. The uncertainty range in the projections has been generated by varying a subset of model parameters. These ranges will be modified as local data becomes available.

Understanding of the virus's epidemiology is continually evolving, both locally and globally. Important parameters about which there remains substantial uncertainty in the scientific literature include the proportion of infections that are truly asymptomatic, the relative infectiousness of these asymptomatic individuals, and the relative duration of infectiousness for these individuals, as well as the severity profile of cases in different contexts. The Appendix presents a sensitivity analysis that examines the effect of varying these factors on the timing and magnitude of the expected epidemic peak.

Budgets had to be calculated before anything was known about the cost and resources needed for these interventions in a routine setting. The estimated budget is based on best available data regarding the likely type, quantity and price of inputs as well as baseline availability of resources such as hospital beds, ventilator equipment, staff and testing capacity and their ability to be re-purposed for the COVID1-9 response. The prices of a number of central resources are currently subject to strong market forces as many countries around the world are competing for the same set of materials. Additionally, the increase in lead times on deliveries resulting from manufacturing countries' travel and trade bans means that even if the budget is made available, supply might not be complete or in time.

Note on the long term and short term projections for COVID-19

Three companion reports have been produced by the National COVID-19 Modelling Consortium to project cases and deaths for the COVID-19 epidemic in South Africa.

1. Short Term Projections: May 2020
2. Long Term National Projections
3. Long Term Provincial Projections

There are a number of key differences in the assumptions used to generate projections in the short and long term.

In the long run, it is expected that biological characteristics of the disease, its progression, severity and mortality, will be similar across the nine provinces. In order to generate long term projections, all provinces were assumed to have the same basic reproductive number (R_0), though this number was allowed to vary stochastically.

However, in the early stages of the epidemic, the disease may have seeded differently in the provinces and in communities with varying contact behaviour. Stochastic events such as clusters of cases or sharp increases in deaths may occur that are divergent from the average pattern. Hence the differences in patterns of growth of the epidemic tend to be larger at the beginning of the epidemic, but reduce as the epidemic progresses. Thus, to provide short term projections reflective of the trends observed in reported deaths, different R_0 values were estimated for each of the provinces.

These stochastic fluctuations are not expected to continue in the long run and therefore the basic reproductive number is assumed to be the same for all provinces in the long term projections. For this reason, there is a lack of congruence between the short term projections for 29 May 2020 and the long term projections for 1 June 2020 in the national and provincial reports.

The short-term projections will be updated on a weekly basis. We are planning to update the long-term projections towards the end of May, taking into account two aspects:

- additional data on the development of cases and deaths after the end of lock-down, which will give us a better estimate of the impact of Level 4 restrictions;
- better consideration of the spatial aspects of the epidemic at lower geographical scales.

Findings: Projected cases in the next six months

We model two scenarios, as detailed in Table 1, to capture uncertainty in the potential effectiveness of lockdown and social distancing measures. The scenarios are modelled as a reduction in the daily contact rate of individuals. Fixed values regarding the size of these reductions were determined by the SA COVID-19 Modelling Consortium. The level of adherence by the population to lockdown and social distancing regulations will influence the effectiveness of these measures.

Table 1. Modelled scenarios of intervention effectiveness

Scenarios	**Description**
Optimistic Effectiveness	Lockdown reduces transmissibility until 30 April ($0.4*R_0$; 60% reduction in transmission relative to baseline) Level four restrictions reduce transmissibility from 1 May to 31 May ($0.65*R_0$; 35% reduction in transmission relative to baseline) Social distancing (school closures, limited public gathering) reduces transmissibility - implemented after 31 May ($0.8*R_0$; 20% reduction in transmission relative to baseline)
Pessimistic Effectiveness	Lockdown reduces transmissibility until 30 April ($0.6*R_0$; 40% reduction in transmission relative to baseline) Level four restrictions reduce transmissibility from 1 May to 31 May ($0.75*R_0$; 25% reduction in transmission relative to baseline) Social distancing (school closures, limited public gathering) reduces transmissibility - implemented after 31 May ($0.9*R_0$; 10% reduction in transmission relative to baseline)

Table 2 summarises the ranges of the number of cases, required hospital and ICU beds, and deaths estimated by the mathematical model. It is important to realise that not all active cases will require healthcare. A substantial proportion of cases (75% in this analysis) are assumed to be asymptomatic or very mildly ill such that they would not require an outpatient care visit and would be very unlikely to seek COVID testing. Approximately 95% of active symptomatic cases are predicted to be mildly ill, with only a fraction of those seeking outpatient care or

COVID testing. **Large case numbers do not necessarily present a large burden on the health system.** As has been the experience of many countries around the world, the vast majority of COVID-19 cases will show no or mild symptoms. Thus, the total case numbers projected by the model and shown in this document are substantially higher than would be reported.

Estimates on hospitalisation and death are based on international data. These will be regularly updated with admissions and case fatality data as these become available and the epidemic progresses. The wide variability in these projections suggests that there is much unknown about the disease. As such these estimates should be treated with caution.

The number of cases detected depends on patients feeling sick enough to seek testing/hospitalisation and being able to receive a test. Different criteria may exist in the public and private sector resulting in different testing and positivity rates. The detection factor takes this into account by adjusting the number of overall cases for those that would be detected. The detection factor is arbitrary in that it may relate only to one point in time. As public awareness and test seeking or contact tracing increases, and as tests are scaled up around the country, this factor will decrease.

Figure 1. Projected National cases

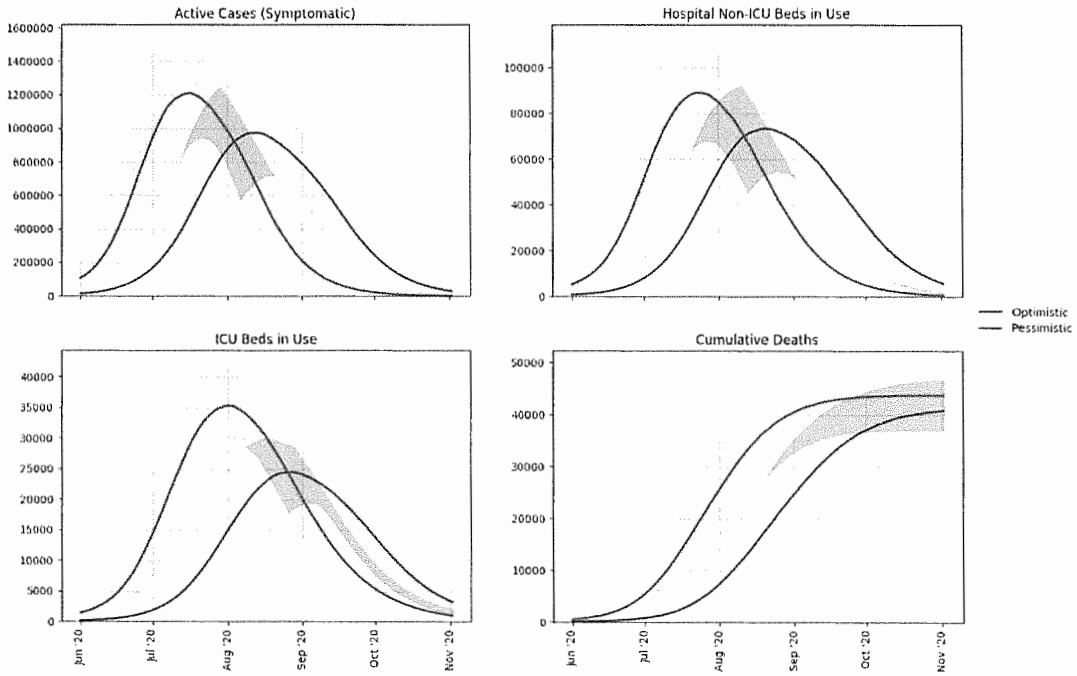


Table 2. Projected National cases

		Cumulative Incidence		Active Cases		
		Total	Symptomatic	All	Symptomatic	Cumulative Detected Cases
Optimistic	2020-06-01	382,366 (237,390 - 632,813)	71,541 (45,134 - 117,526)	82,298 (43,008 - 157,053)	14,763 (7,736 - 28,712)	15,817 (10,702 - 24,781)
	2020-07-01	3,661,393 (1,676,865 - 7,448,898)	598,489 (276,180 - 1,299,104)	966,647 (398,228 - 2,163,111)	169,318 (69,374 - 392,257)	112,997 (55,232 - 238,964)
	2020-08-01	21,686,098 (11,622,701 - 32,540,064)	4,270,362 (2,105,178 - 7,179,877)	4,696,334 (2,602,093 - 6,255,373)	874,156 (472,490 - 1,264,623)	910,318 (439,042 - 1,642,691)
	2020-09-01	41,487,628 (30,638,488 - 48,321,906)	9,524,163 (6,518,622 - 12,275,248)	4,063,347 (2,953,085 - 4,502,688)	791,638 (594,880 - 968,958)	2,416,136 (1,592,775 - 3,282,335)
	2020-10-01	47,781,735 (42,677,516 - 50,722,344)	11,744,679 (9,571,499 - 13,614,809)	1,171,259 (400,569 - 2,396,710)	244,925 (85,914 - 489,073)	3,245,104 (2,589,072 - 3,817,607)
	2020-11-01	48,658,190 (45,681,241 - 50,944,673)	12,153,147 (10,261,464 - 13,828,132)	141,168 (35,705 - 515,442)	32,146 (8,367 - 107,815)	3,450,932 (2,896,897 - 3,932,537)
Pessimistic	2020-06-01	2,306,459 (1,343,540 - 4,094,445)	394,780 (226,084 - 718,080)	598,761 (313,294 - 1,171,397)	107,255 (54,538 - 214,996)	76,106 (44,955 - 129,884)
	2020-07-01	20,139,796 (12,223,262 - 29,701,255)	3,761,577 (2,072,257 - 6,186,825)	5,058,676 (3,006,812 - 7,170,122)	942,500 (529,302 - 1,444,940)	743,689 (400,140 - 1,271,758)
	2020-08-01	44,867,939 (36,510,103 - 50,458,627)	10,327,075 (7,579,812 - 12,934,700)	5,011,909 (3,855,147 - 5,574,058)	991,907 (776,146 - 1,187,468)	2,586,688 (1,830,408 - 3,340,153)
	2020-09-01	50,929,041 (48,236,582 - 52,942,777)	12,651,032 (10,639,563 - 14,532,758)	960,210 (380,199 - 2,037,842)	212,102 (88,366 - 433,899)	3,532,779 (2,920,352 - 4,080,889)
	2020-10-01	51,444,712 (49,503,933 - 53,109,938)	12,926,688 (10,934,833 - 14,686,634)	87,694 (28,465 - 265,289)	23,404 (8,869 - 62,399)	3,670,117 (3,104,194 - 4,173,374)
	2020-11-01	51,474,905 (49,631,737 - 53,126,395)	12,941,100 (10,948,713 - 14,710,158)	7,199 (2,221 - 25,104)	2,579 (1,031 - 7,161)	3,685,249 (3,118,462 - 4,187,290)

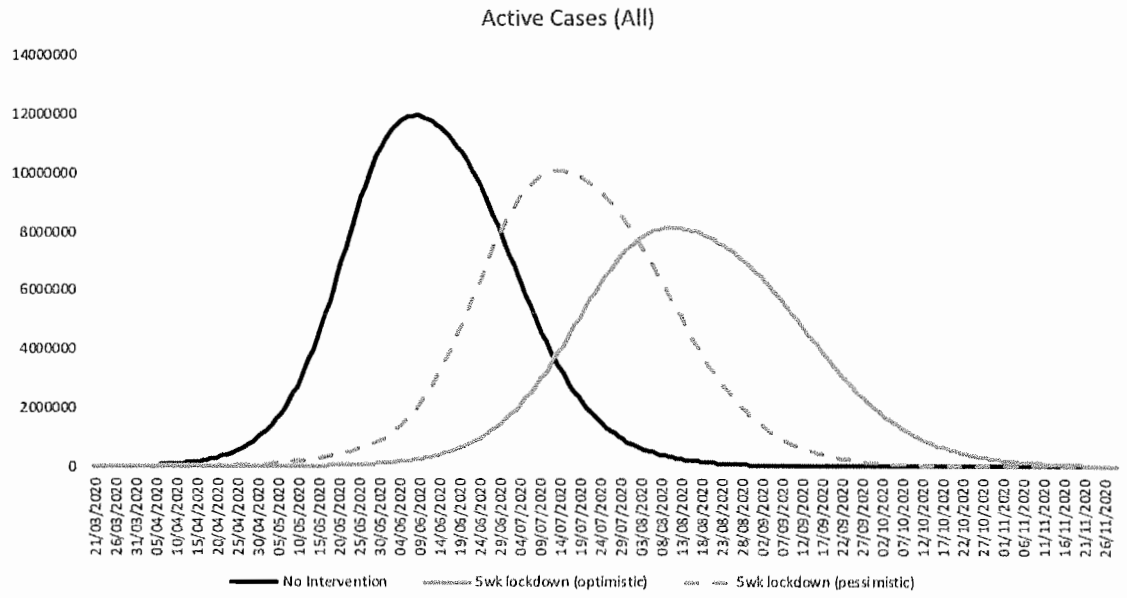
		Cumulative Admissions		Hospital Beds in Use		
		Non-ICU	ICU	Non-ICU	ICU	Cumulative Deaths
Optimistic	2020-06-01	2,256 (1,533 - 3,473)	729 (509 - 1,088)	797 (459 - 1,417)	206 (124 - 353)	151 (112 - 216)
	2020-07-01	15,559 (7,494 - 32,584)	4,563 (2,288 - 9,305)	8,079 (3,637 - 17,771)	1,904 (860 - 4,177)	822 (431 - 1,618)
	2020-08-01	120,685 (57,869 - 211,333)	38,392 (17,898 - 69,730)	54,543 (28,321 - 84,713)	14,973 (7,120 - 24,936)	7,430 (3,386 - 14,249)
	2020-09-01	295,663 (187,592 - 417,938)	106,621 (66,939 - 152,058)	68,893 (52,545 - 84,191)	24,113 (19,203 - 27,907)	24,750 (14,979 - 35,296)
	2020-10-01	382,637 (228,801 - 545,682)	146,208 (88,301 - 206,118)	31,924 (13,493 - 51,484)	13,629 (7,664 - 18,921)	37,090 (28,446 - 44,459)
	2020-11-01	398,642 (233,027 - 592,912)	154,810 (90,736 - 228,674)	6,034 (1,663 - 17,179)	3,372 (1,321 - 7,716)	40,784 (34,015 - 46,657)
Pessimistic	2020-06-01	10,491 (6,252 - 18,515)	3,134 (1,906 - 5,373)	5,295 (2,904 - 9,990)	1,427 (815 - 2,586)	571 (363 - 940)
	2020-07-01	100,141 (53,767 - 170,262)	30,273 (16,056 - 53,112)	51,450 (28,253 - 82,260)	14,483 (7,651 - 24,735)	5,486 (2,849 - 9,869)
	2020-08-01	317,464 (218,114 - 430,965)	113,133 (77,200 - 155,052)	85,462 (66,685 - 105,619)	35,380 (27,830 - 41,328)	25,647 (17,037 - 34,982)
	2020-09-01	414,516 (268,720 - 575,892)	158,892 (104,060 - 218,569)	31,851 (15,444 - 53,186)	20,121 (13,658 - 26,613)	40,565 (32,773 - 47,489)
	2020-10-01	425,360 (272,006 - 605,924)	165,134 (106,082 - 234,462)	5,024 (1,915 - 12,257)	5,410 (3,073 - 9,545)	43,543 (36,811 - 49,614)
	2020-11-01	426,207 (272,216 - 609,022)	165,634 (106,210 - 236,259)	606 (215 - 1,818)	1,078 (577 - 2,125)	43,831 (37,094 - 49,774)

**Projections on hospital bed use assume unconstrained resources (testing, hospital beds, ICU beds)

The projected impact of lockdown

The scale-up in testing and data collected over the next few weeks will allow models to estimate the impact of lockdown. In the absence of such data, using the suggested optimistic and pessimistic effectiveness of lockdown, the model projected the epidemic curve for the scenarios of no intervention and the 35-day lockdown followed by Level 4 restrictions for one month and social distancing thereafter. The figure below is subject to wide uncertainty when estimating eight months into the future. The optimistic and pessimistic impacts of lockdown demonstrate considerable shifts in and flattening of the epidemic curve. The projected epidemic curves in Figure 2 show all active infections (asymptomatic and symptomatic), whether detected or not.

Figure 2. Projected epidemic curves (total active infections) under the 5-week lockdown scenario compared to a hypothetical scenario with no lockdown



Required budget

We projected the required budget for the first 6 months of the COVID-19 response (Apr-Sept 2020) under the pessimistic and optimistic scenarios, covering the incremental cost of personal protective equipment (PPE), additional ICU and hospital beds and staff, additional PHC staff, ventilators, oxygen, drugs at all levels of care, isolation facilities, testing and surveillance and Port Health budgets. Excluded are the costs of setting up and running field hospitals, oxygen delivery equipment, additional testing platforms beyond the currently planned ones (Xpert and Alinity), and additional NHLS staff. Stipends for additional community health workers to carry out screening activities are excluded as these are funded by a donor's budget; their PPE and other equipment is however covered. Based on this, the required total budget for the national and provincial departments of health will be between 26 and 32 billion rand over the next 6 months, of which between 10 and 15 billion rand will accrue to the National Department of Health (NDOH), in keeping with the additional 20 billion rand allocation for the medical aspect of the COVID-19 response announced by the President on 21 April 2020. (Note that while the details of the distribution of the budget items between the NDOH and provinces are still subject to discussion, this distribution assumes that the cost of testing, thermometers, drugs, and PHC staff will be borne by provinces).

Provincial variability

The epidemics in the provinces that had early seeding and growth of the epidemic (KwaZulu-Natal, Gauteng and Western Cape) are all expected to peak quickly. The peaks of other provinces are projected to occur later due in part to their population distribution and delayed seeding. Once public sector testing has increased substantially, the models will be re-calibrated to better inform exact timing of each provincial peak and at which dates the hospital resources are expected to be exceeded. Figure 3 below shows this variation in timing of the epidemic peak between the provinces under the optimistic and pessimistic lockdown scenarios.

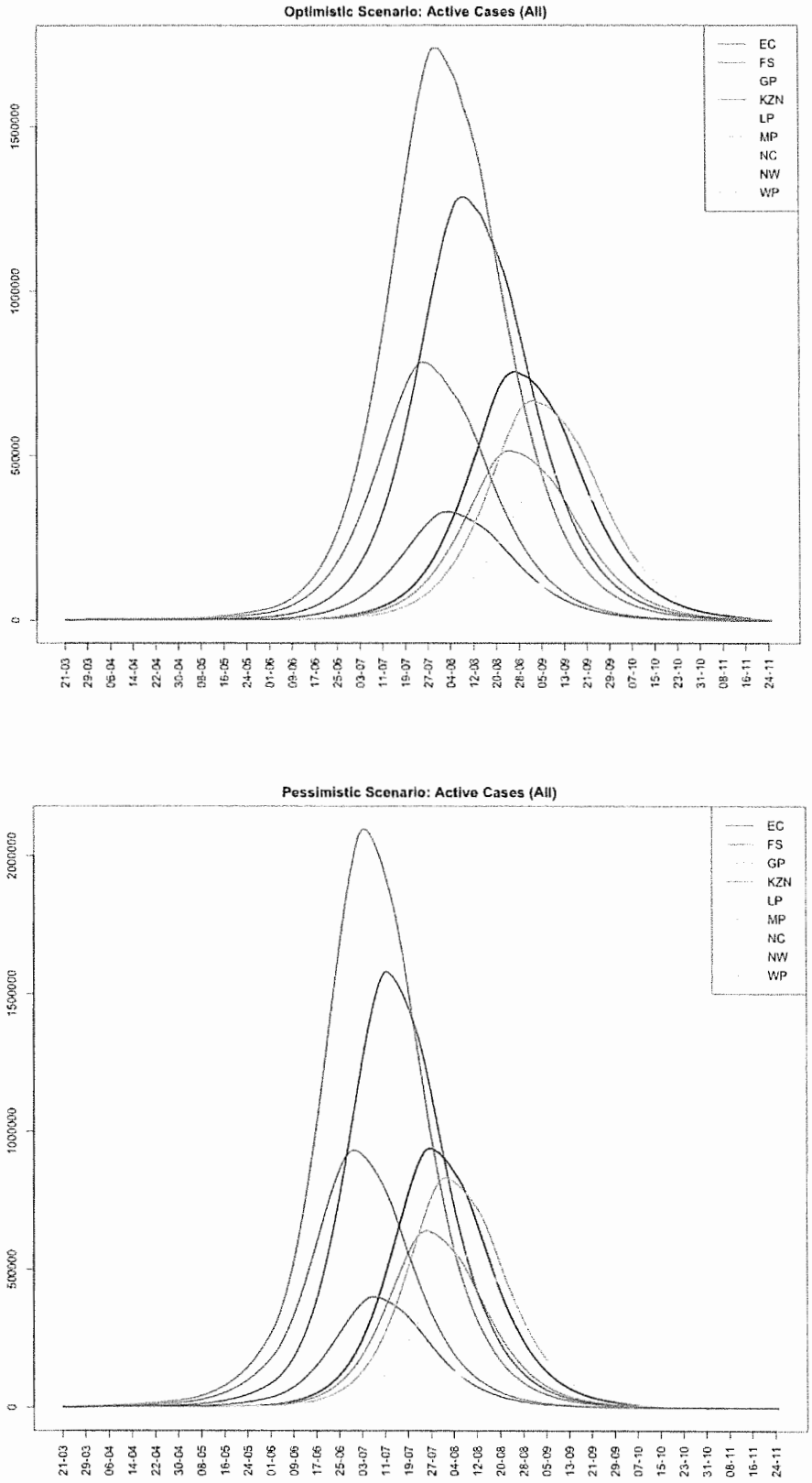


Figure 3. Projected provincial epidemic curves under optimistic and pessimistic scenarios

Key Parameter values:

Table 4 below shows the values of key parameters used to inform the model. Parameter values have been selected for use by an expert panel of clinicians on the SA Covid-19 Modelling Consortium.

Table 4. Key model parameters

	Parameter	**Value (range)**	**Sources**
Infection severity**	Proportion of cases that are asymptomatic	75% (0.7, 0.8)	[1], [2], [3]
	Mild to moderate cases among the symptomatic	(95.64%, 96.78%)	[5]
	Severe cases among the symptomatic	(2.46%-3.64%)	
	Critical cases among the symptomatic	(1.16%-1.45%)	
	Proportion of cases that are fatal	(0.30%, 0.412%)	[4], [5]
Timeframes & treatment durations	Time from infection to onset of infectiousness	4 days (2.0-6.0)	[4], [6], [7], [8], [9], [10] with input from analysis of NICD data.
	Time from onset of infectiousness to onset of symptoms	2 days (1.0-3.0)	
	Duration of infectiousness from onset of symptoms	5 days (4.0, 6.0)	
	Time from onset of mild symptoms to testing	4 days (3.0-5.0)	
	Time from onset of symptoms to hospitalisation	5 days (4.0–6.0)	
	Time from onset of symptoms to ICU admission	9 days (7.0–11.0)	
	Duration of hospital stay	12 days (8.0–14·0)	
	Duration from ICU admission to discharge	18 days (14·0–18·0)	
	Duration from ICU admission to death	5 days (4.0-7.0)	

Data sources

The model has been informed by published and pre-print academic literature, global COVID-19 case information (specifically from the European CDC, World Health Organization and China CDC), South African population statistics from Stats SA's 2019 mid-year report, expert input from members of the SA COVID-19 Modelling Consortium, and national case details from the South African National Institute for Communicable Diseases and https://sacoronavirus.co.za/category/press-releases-and-notices/.

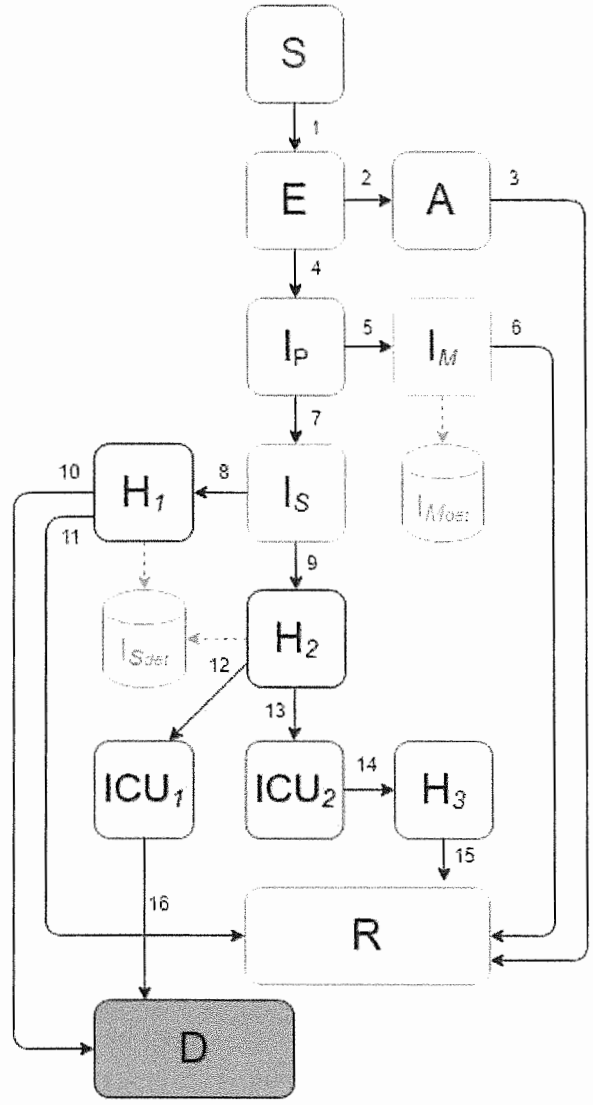
About the National COVID-19 Epi Model

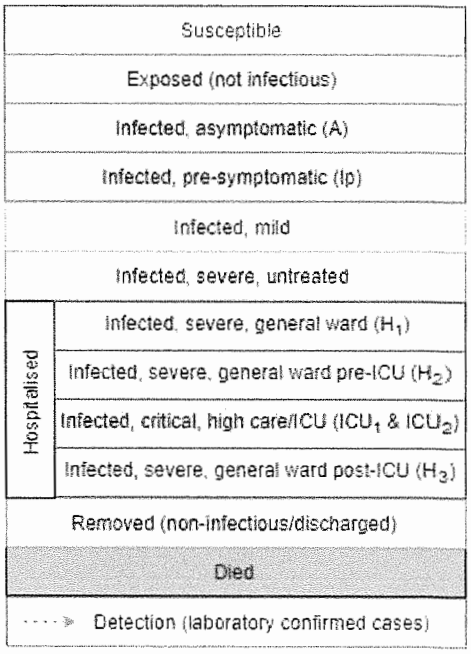
The National COVID-19 Epi Model (NCEM) is a stochastic compartmental transmission model to estimate the total and reported incidence of COVID-19 in the nine provinces of South Africa. The outputs of the model may be used to inform resource requirements and predict where gaps could arise based on the available resources within the South African health system. The model follows a generalised Susceptible-Exposed-Infectious-Recovered (SEIR) structure accounting for disease severity (asymptomatic, mild, severe and critical cases) and the treatment pathway (outpatients, non-ICU and ICU beds) as shown in Figure 4. Contributors to the NCEM include Sheetal Silal, Rachel Hounsell, Jared Norman, Juliet Pulliam, Roxanne Beauclair, Jeremy Bingham, Jonathan Dushoff, Reshma Kassanjee, Michael Li, Cari van Schalkwyk, Alex Welte, Lise Jamieson, Brooke Nichols and Gesine Meyer-Rath. For more information please contact Dr Sheetal Silal (sheetal.silal@uct.ac.za).

About the National COVID-19 Cost Model

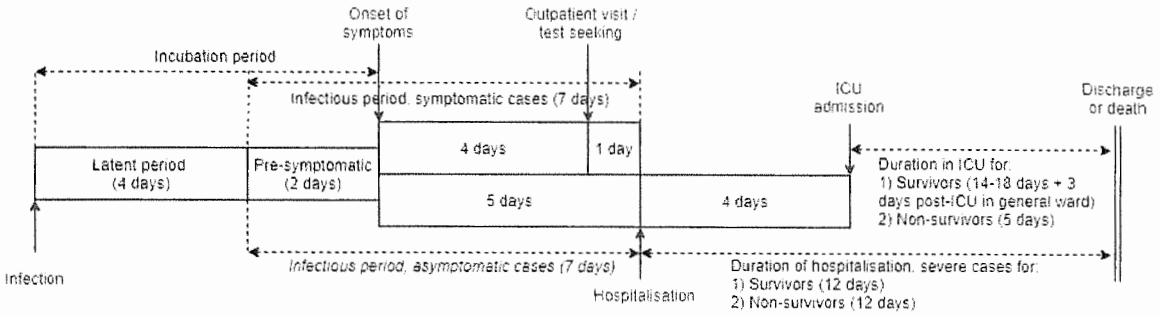
The National COVID-19 Cost Model (NCCM) was developed using inputs from a range of health economists in South Africa contributing data from existing sources that were adapted to represent the type, number, and prices of ingredients required in the country's COVID-19 response. The model produces the COVID-19 response budget for the National and provincial departments of health, incremental to existing resources such as hospital beds and staff contingents. Contributors to the NCCM include Gesine Meyer-Rath, Kerensa Govender, and Jacqui Miot from the Health Economics and Epidemiology Research Office (HE2RO) at Wits, Nikhil Khanna and colleagues at the Clinton Health Access Initiative (CHAI) South Africa, Ijeoma Edoka and colleagues at PRICELESS at Wits, Donnela Besada and Emmanuelle Daviaud at the Medical Research Council (MRC), Steve Cohen at Genesis, and David Crewe-Brown from SCTA. For more information please contact Dr Gesine Meyer-Rath (gesine@bu.edu).

Figure 4. Generalised SEIR Model Structure (Disease and Treatment Pathway)





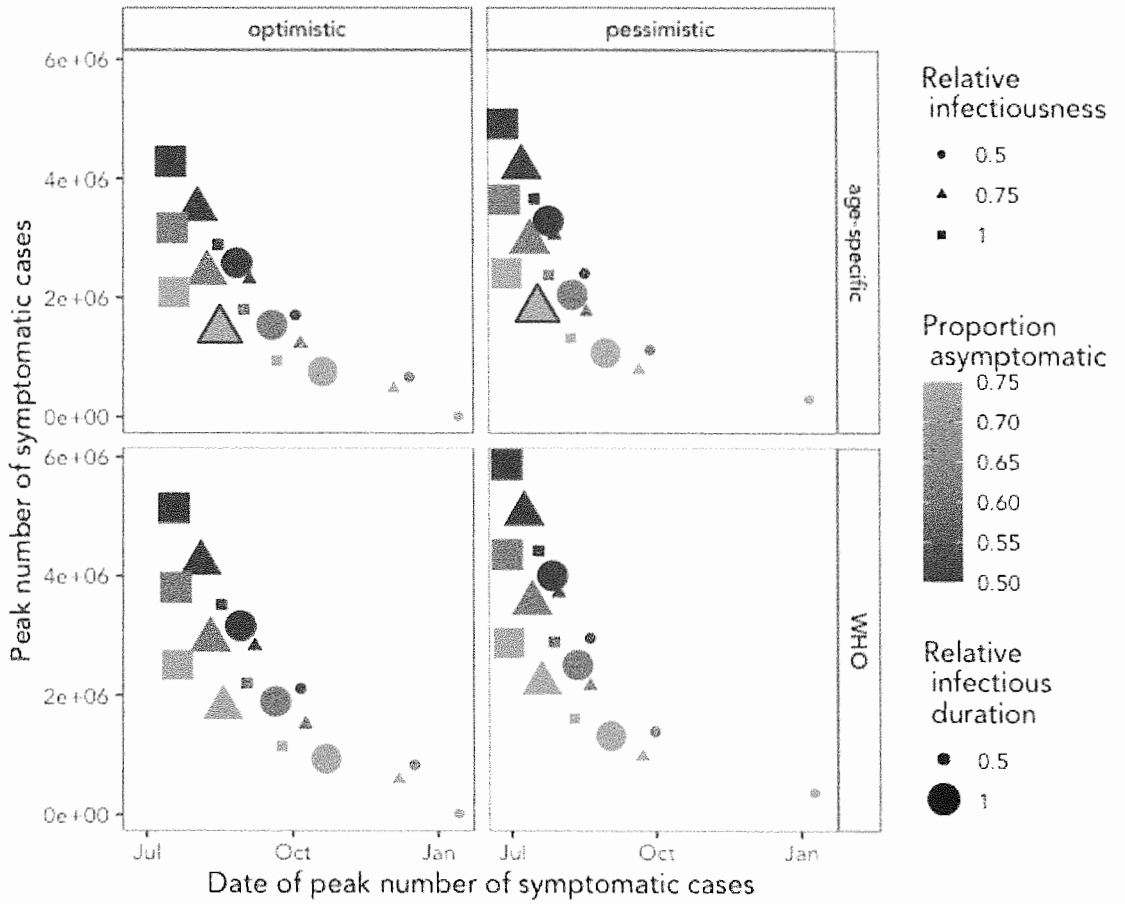
1. Force of infection
2. Latent period till asymptomatic infectiousness
3. Duration of asymptomatic infectiousness
4. Latent period till pre-symptomatic infectiousness
5. Mild cases
6. Duration of infectiousness (mild cases)
7. Severe cases
8. Hospitalisation of severe cases
9. Hospitalisation of critical cases (prior to ICU)
10. Mortality (severe, hospitalised cases)
11. Duration of hospitalisation (severe cases)
12. Progress from severe to critical (ICU admission)
13. Progress from severe to critical (ICU admission)
14. Duration of ICU stay for survivors
15. Duration of hospitalisation post-ICU
16. Mortality (critical, ICU cases)



Appendix

Sensitivity analysis to examines the effect of varying certain parameters on the timing and magnitude of the expected epidemic peak. The points representing the parameters used in the main analyses are outlined in red. The following parameters were explored:

- Proportion of infectious that are asymptomatic throughout the course of infection (values considered in sensitivity analysis: 0.5, 0.625, 0.75; value used in main analysis: 0.75).
- Relative infectiousness of asymptomatic infections to symptomatic ones (values considered in sensitivity analysis: 0.5, 0.75, 1; value used in main analysis: 0.75).
- Infectious duration of asymptomatic infections relative to mild infections (values considered in sensitivity analysis: 0.5, 1; value used in main analysis: 1).
- Distribution of mild, severe, and critical cases (levels considered were the values as presented in the WHO-China mission report and values derived from adjusting the China age-specific severity values to the South African population; the adjusted, age-specific values were used in the main analysis).
- Scenario regarding effectiveness of interventions (optimistic and pessimistic, as described above; both are presented in main analysis).



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Estimating cases for COVID-19 in South Africa
Update: 19 May 2020

Silal[1], Juliet Pulliam[2], Gesine Meyer-Rath[3,4], Brooke Nichols[3,4], Lise Jamies
Kimmie[5], & Harry Moultrie[5]

on behalf of the South African COVID-19 Modelling Consortium

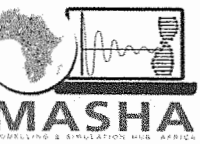
[1] Modelling and Simulation Hub, Africa (**MASHA**), University of Cape Town, South Africa

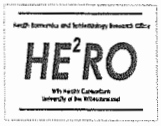
frican DSI-NRF Centre of Excellence in Epidemiological Modelling and Analysis (**SACEMA**), University of Stellenbosch,

Health Economics and Epidemiology Research Office (**HE²RO**), University of the Witwatersrand, Johannesburg, South

[4] Boston University School of Public Health, US

[5]National Institute for Communicable Diseases **(NICD)**, South Africa





oduction

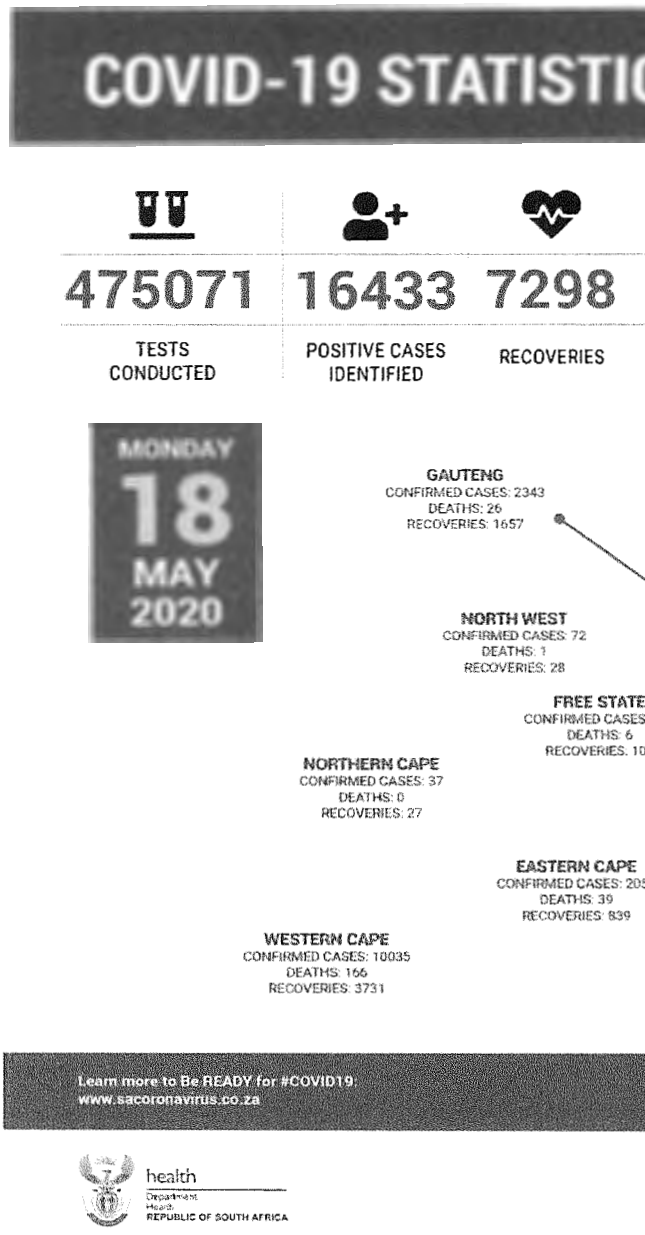
h African COVID-19 Modelling
sortium

ertainty regarding both the true scale and
ial distribution as a result of PUI criteria
testing coverage

lels developed by MASHA, SACEMA and
RO in conjunction with the NICD

nsive and ongoing input from clinicians,
ogists, intensivists and epidemiologists to
e key model assumptions and
meters

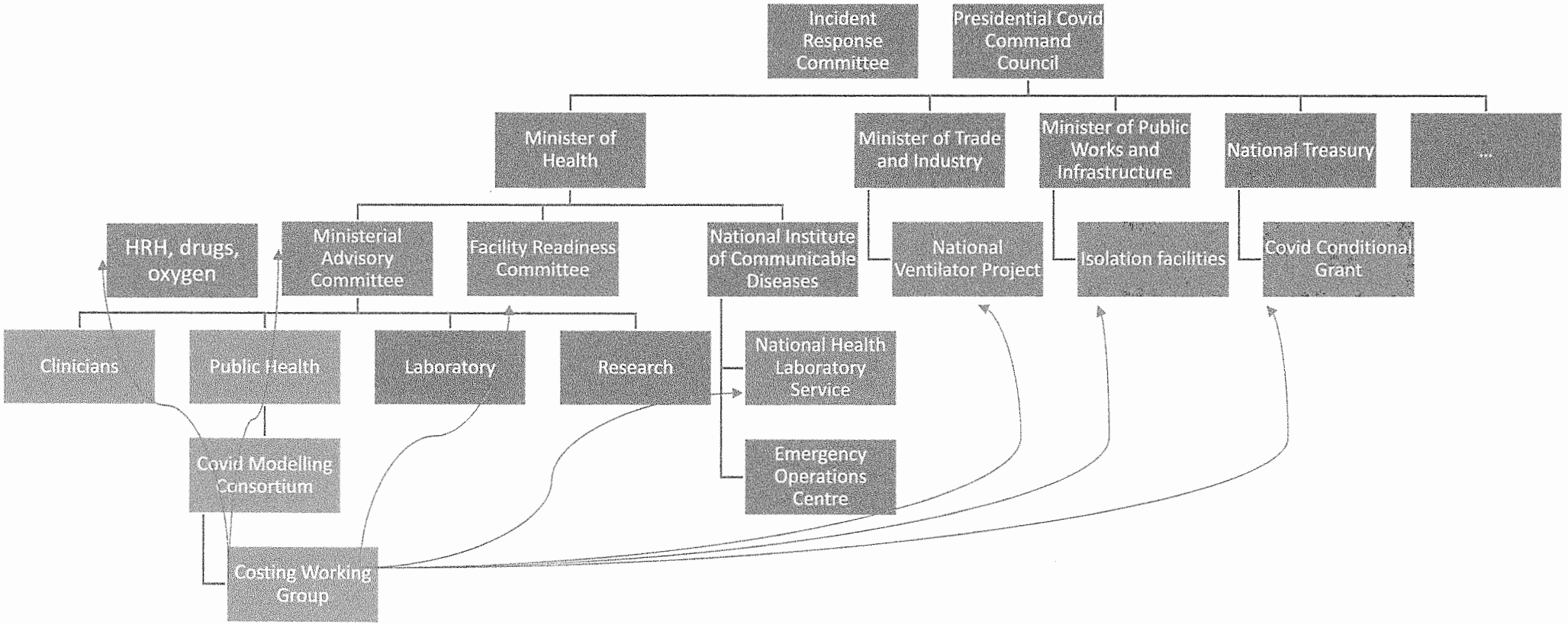
ections will be updated weekly



ojections in Context

- ojections at a population level do not capture clustering of case
  - E.g. Sharp increases in cases in the Eastern Cape
  - A spatial model with additional granularity is required (forthcoming)
- odels project total need for hospital beds and ICU beds
  - Do not account for stricter criteria to entry and existing capacity
- pulation behaviour/response to mortality
  - Lessons from Ebola epidemic (adaptive behaviour to decrease mortality)
- ojections will improve with new data
  - Hospitalisation (public and private)
  - Length of stay
- ort term vs Long term Projections

Users of model outputs



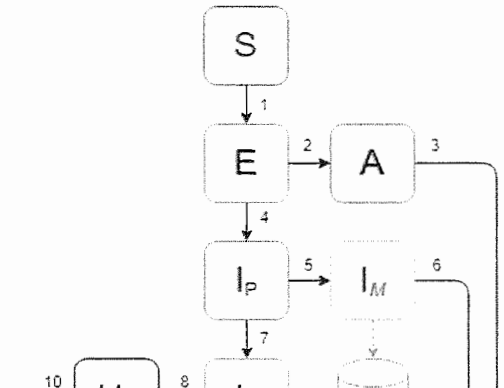
al COVID Models

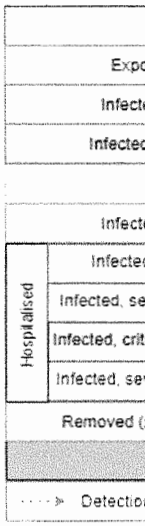
nal COVID-19 Epi Model

- neralised SEIR model
- sease severity (asymptomatic, mild, severe, tical)
- eatment pathway (outpatients, non-ICU, ICU)

nal COVID-19 Cost Model

- puts from a range of resources to represent e type, number and price of ingredients to st response
- n resource requirements and predict e gaps may arise based on available rces





o scenarios

nption: Level 4 continues until 31 May followed by social distancing measures

nistic scenario

kdown reduced transmissibility by **60%**

el 4 from 1 May to 31 May: **35%**

ial distancing measures after 31 May reduces transmissibility by **20%**

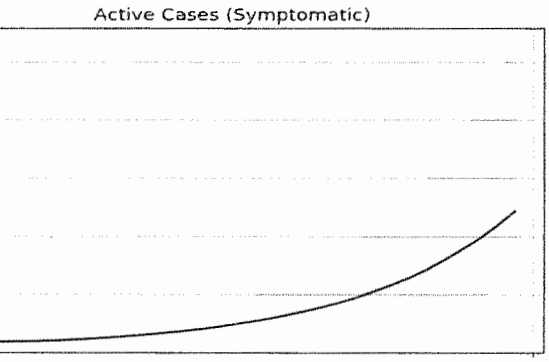
mistic scenario

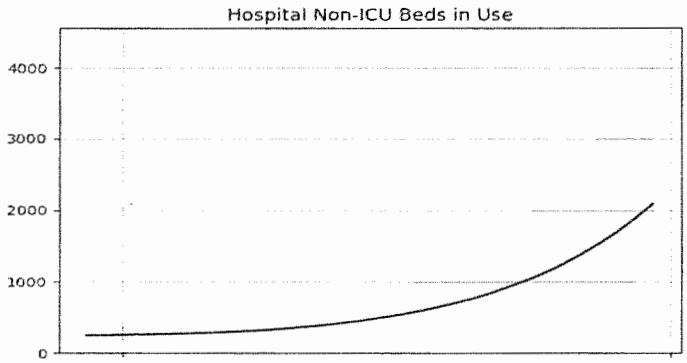
kdown reduced transmissibility by **40%**

el 4 from 1 May to 31 May: **25%**

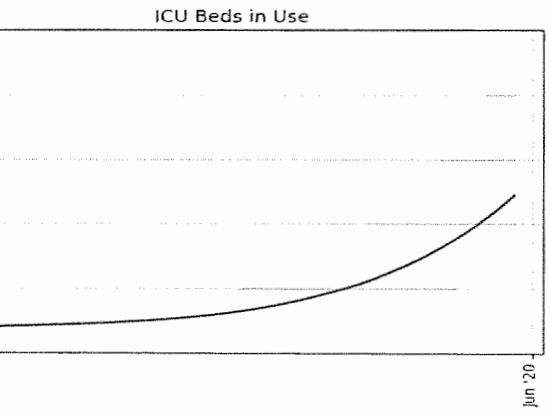
ial distancing measures after 31 May reduces transmissibility by **10%**

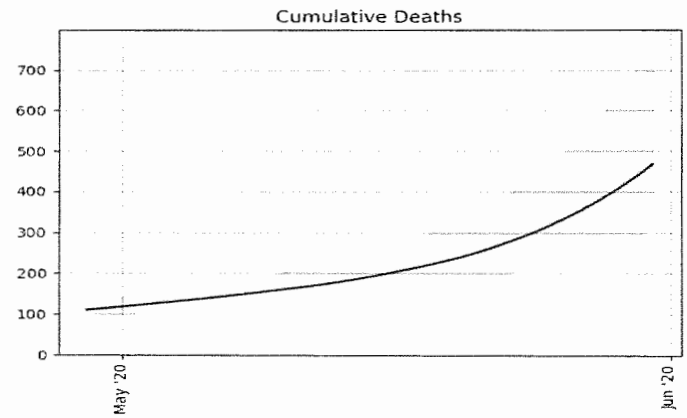
erm projections





Detected Cases
30, 433 (18,71





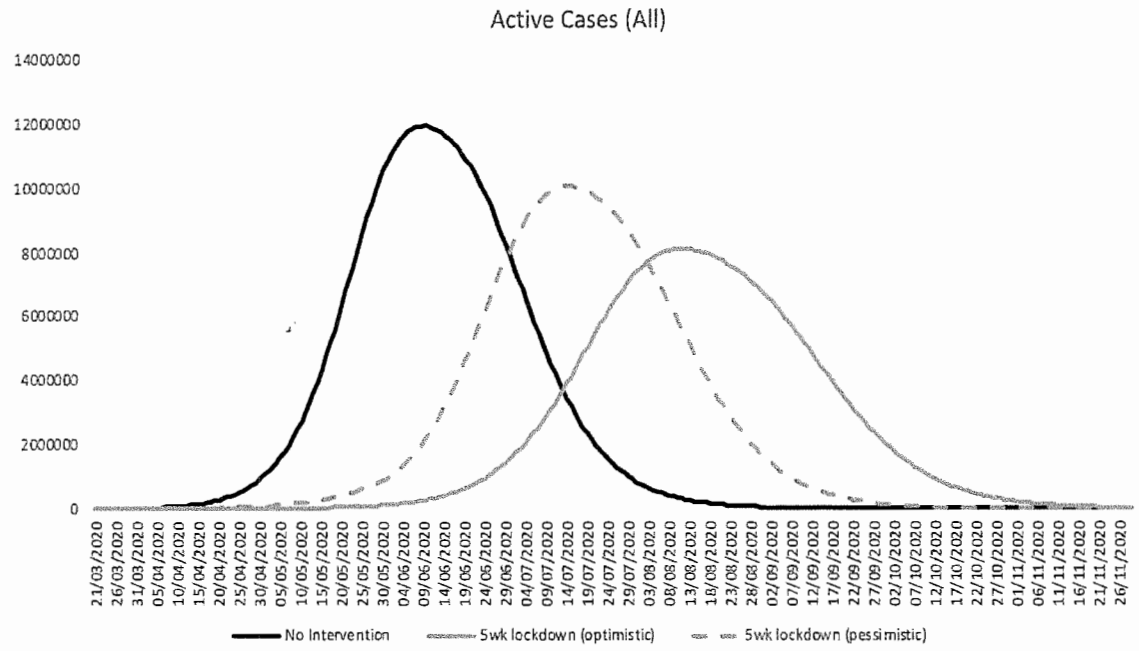
ICU bed threshol

Long-term projections

NATIONAL

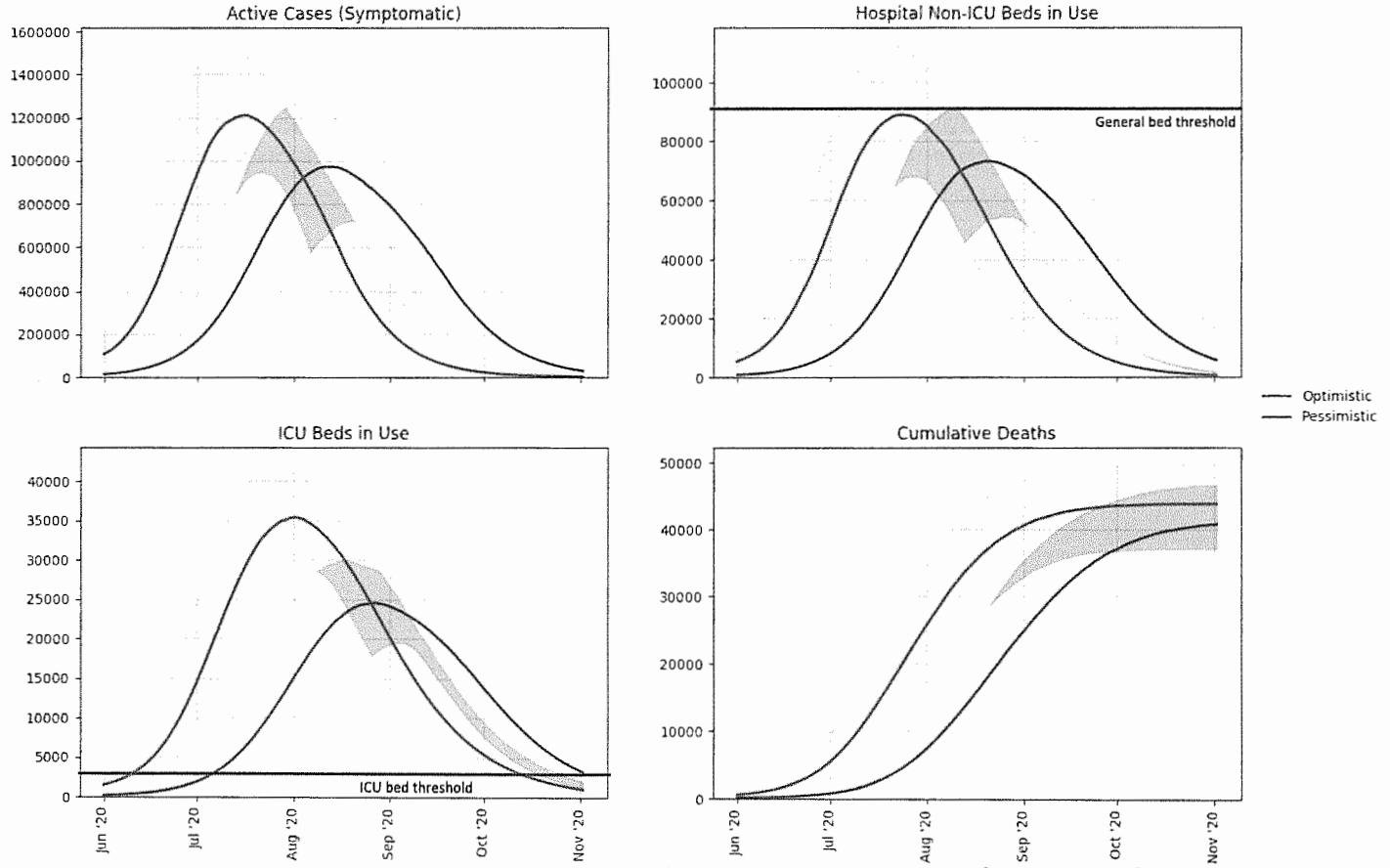
Long-term projections: Impact of lock-down

- Greater uncertainty
- Lockdown has flattened the curve and pushed the peak later



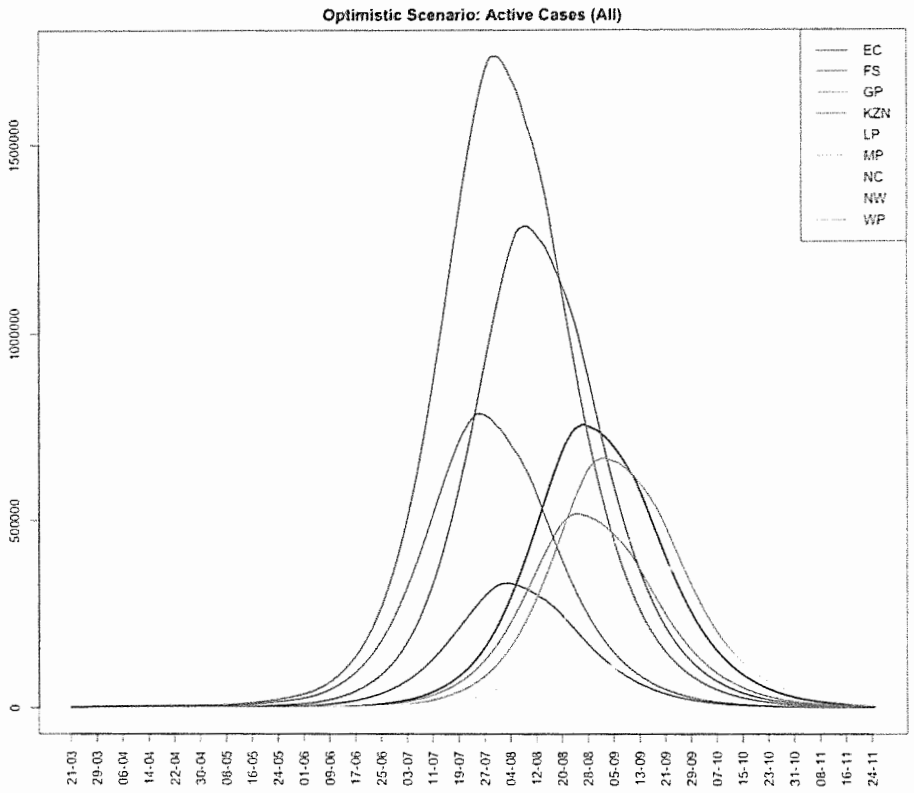
Key Assumption: Asymptomatic proportion of cases: **75%**

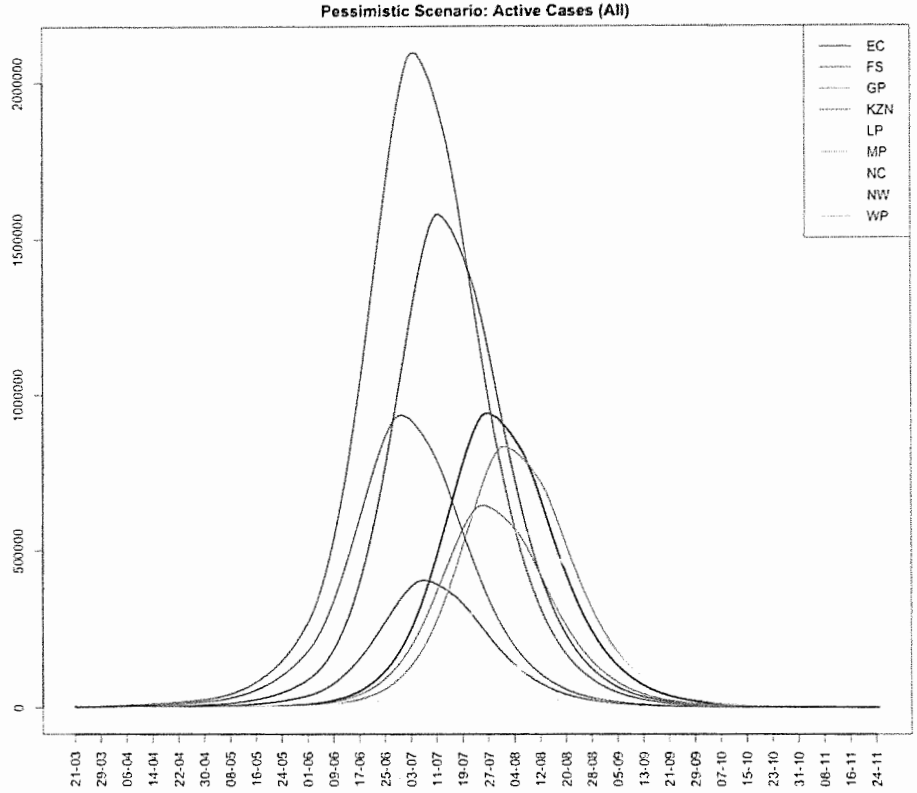
erm projections: National



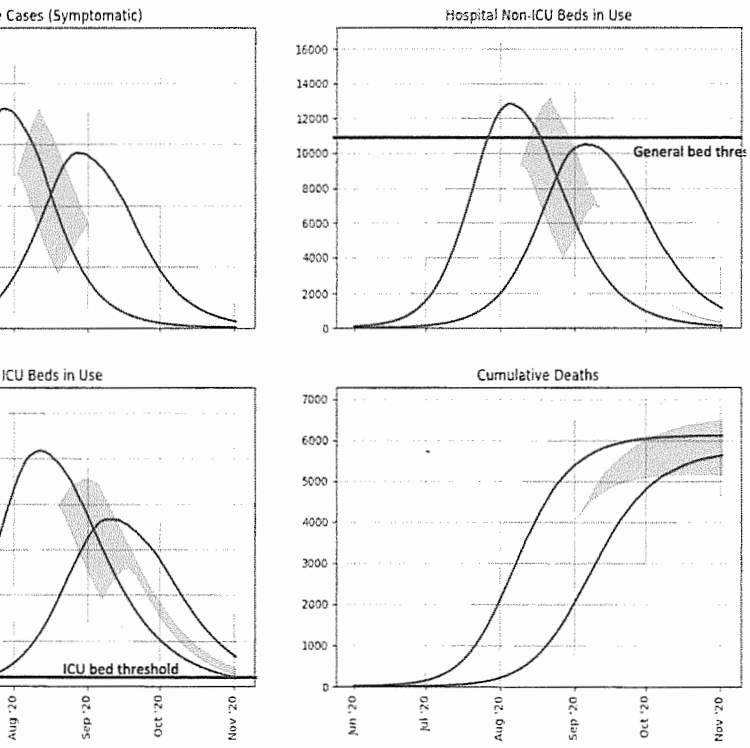
Current trajectory of **detected** cases: Optimist

Provincial Projections



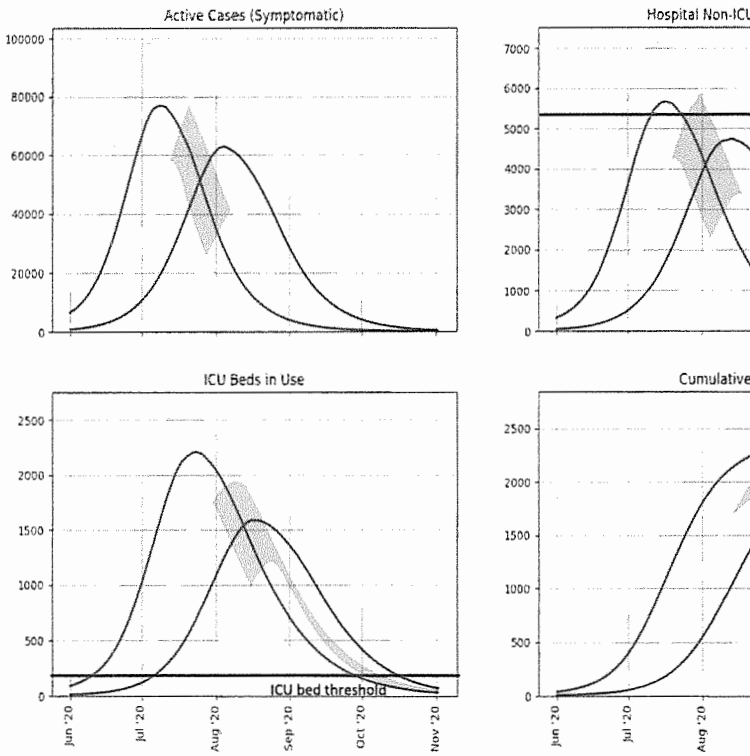


stern Cape



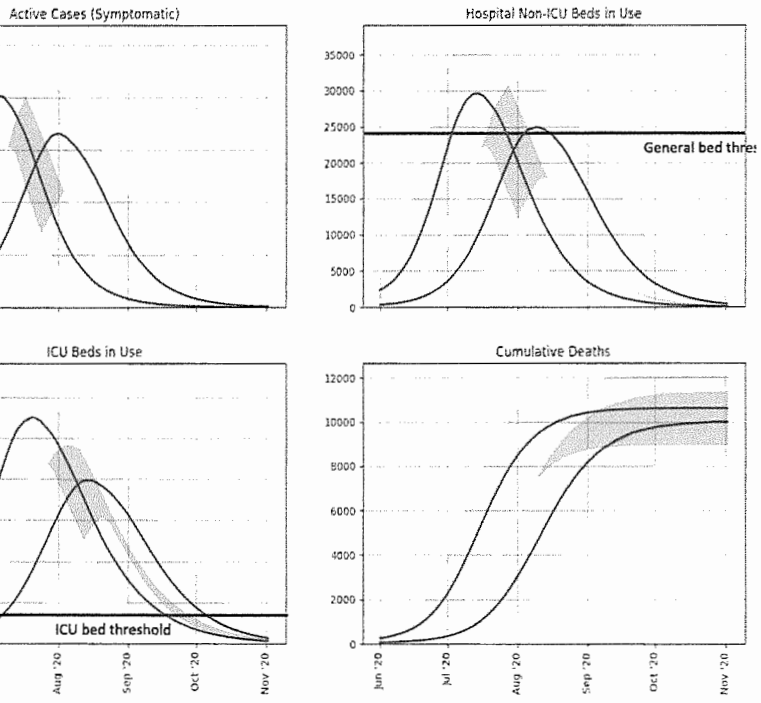
trajectory of **detected** cases: Pessimistic

Free State



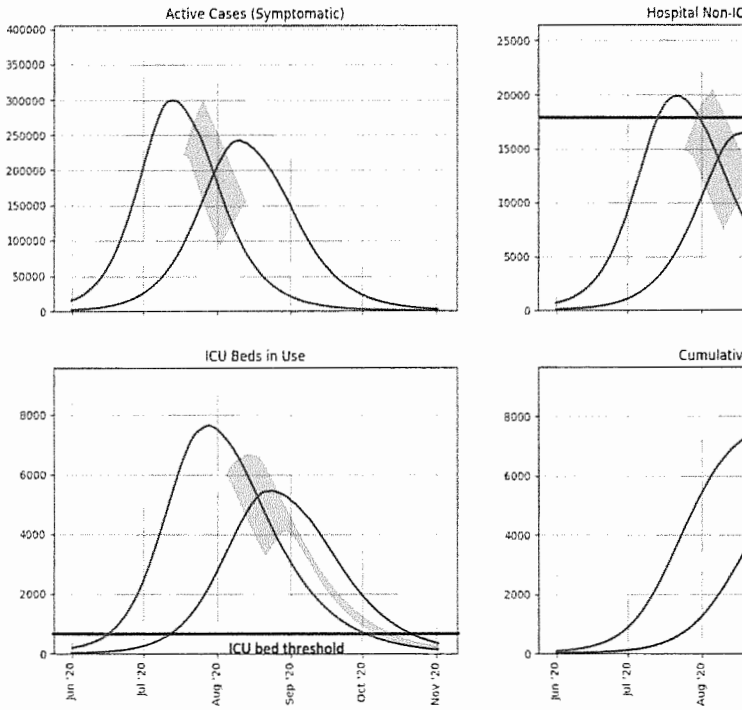
Current trajectory of **detected** cases: Better

uteng



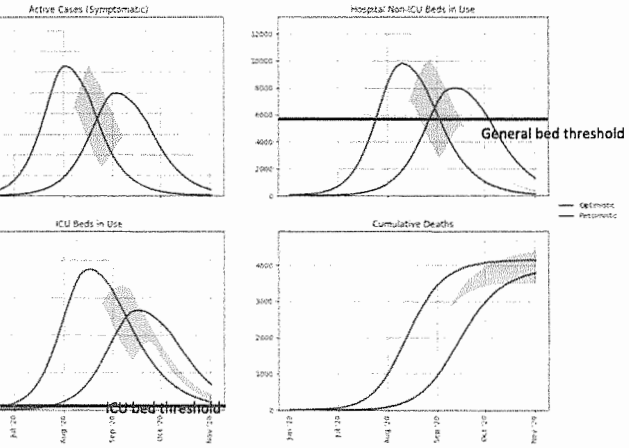
t trajectory of **detected** cases: Optimistic

Kwa-Zulu Nat

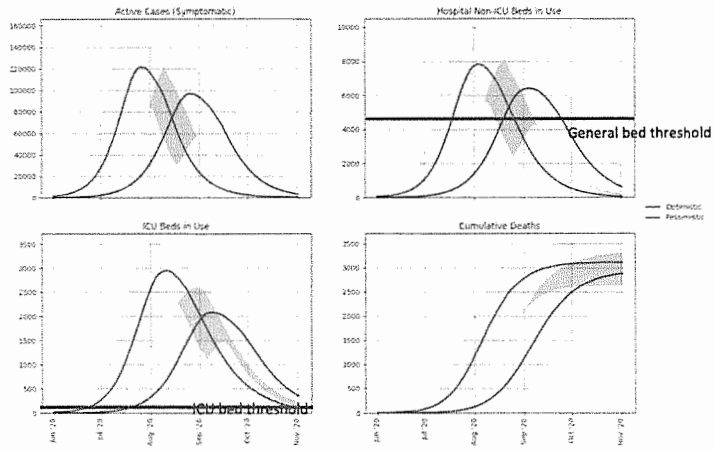


Current trajectory of **detected** cases: Optimi

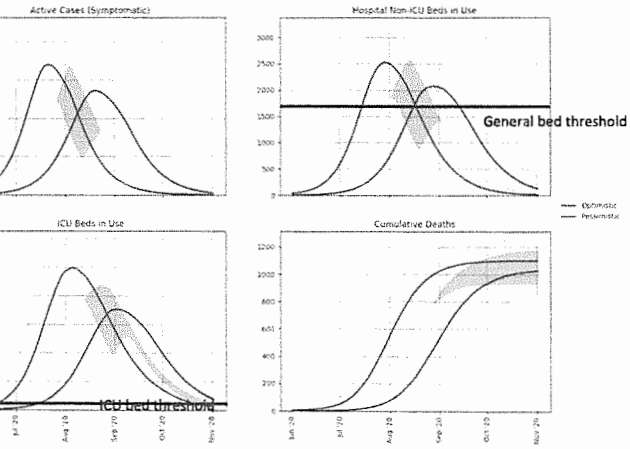
Limpopo



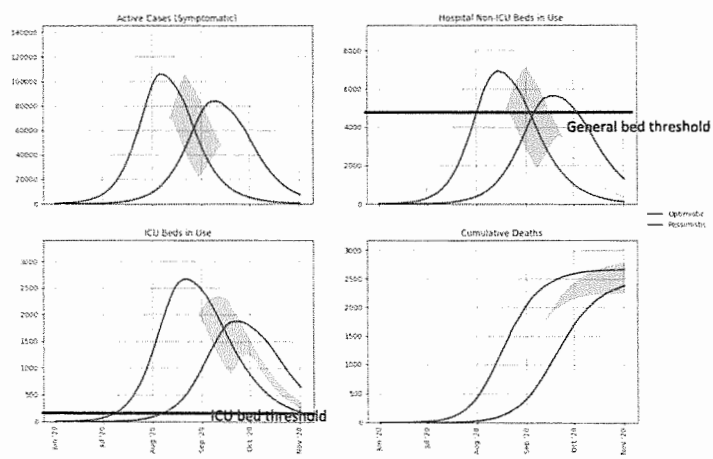
Mpumalanga



Northern Cape



North West



Cu
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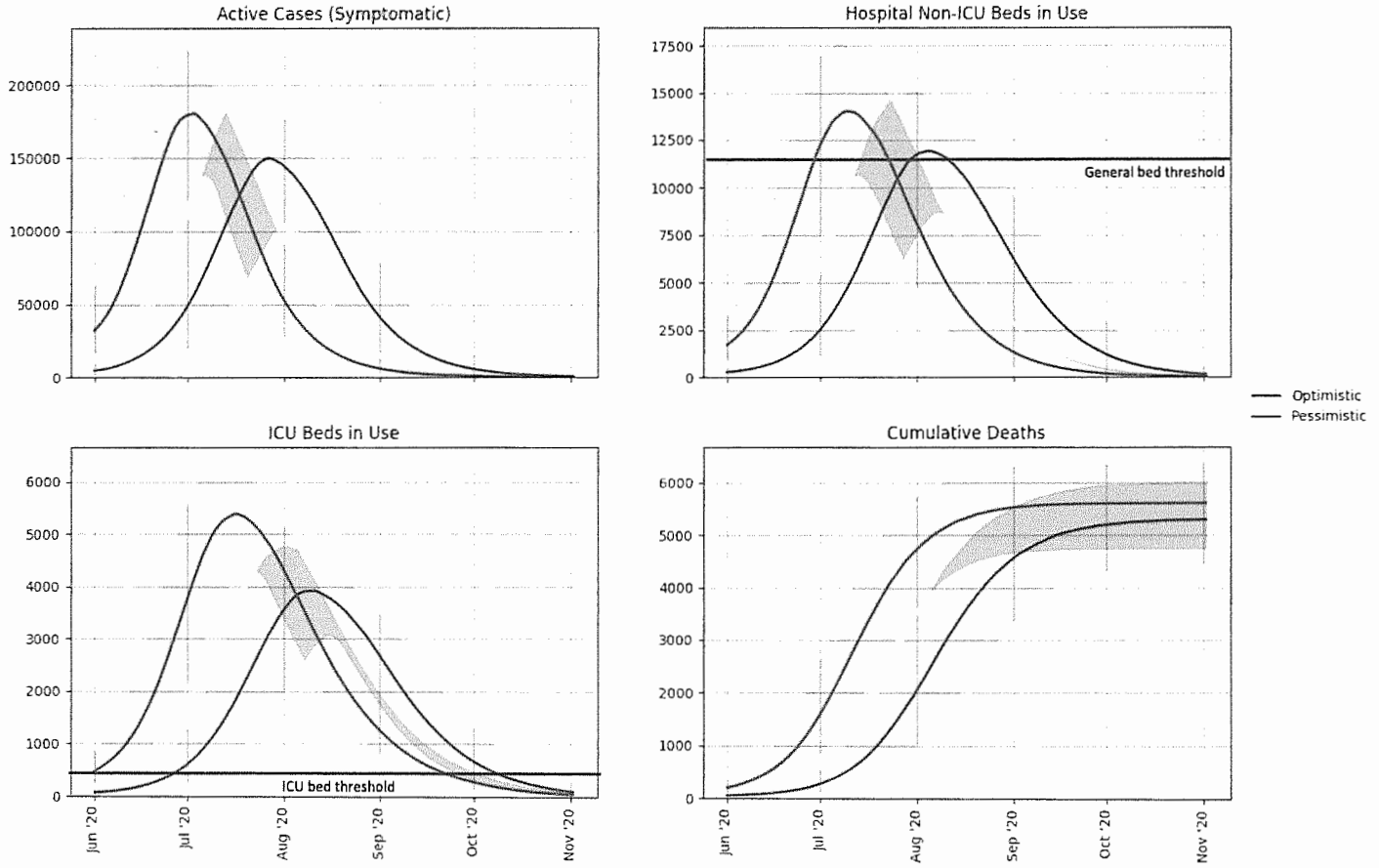


Current trajectory of **detected** cases: Pessim

nclusions

e initial social distancing and lockdown measures have worked:

- Epidemic curve has flattened and peak been delayed
- Extension of lockdown to 5 weeks bought us critical additional time to ramp up community testing and prepare mitigation measures for the oncoming wave

ak in active cases likely between early July (pessimistic) and early A ptimistic). This will be affected by post-lockdown measures.

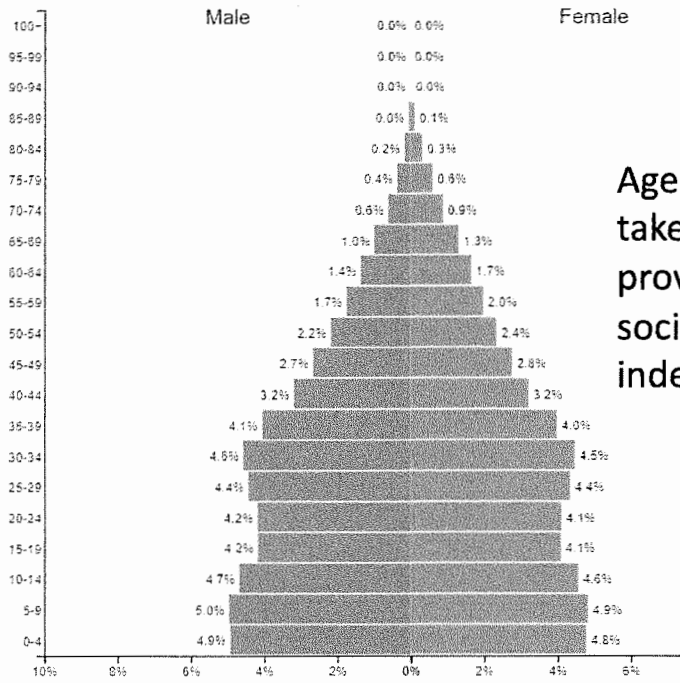
nsiderable variation in timing and scale of peaks between Province riation will be greater between districts and sub-districts.

der almost all scenarios hospital and ICU capacity will be exceeded ough timing and extent is uncertain. Requires a flexible approach to source acquisition with initial purchases now and additional orders ore information becomes available

e severity with age-specific adjustment for Sou

Severe cases (hospitalized) of confirmed cases	Critical (of severe)	Fatal (of critical)
2%	0%	0%
2%	0%	0%
10%	12%	5%
15%	16%	5%
21%	19%	7%
25%	23%	17%
31%	25%	28%
40%	30%	34%
47%	30%	83%

nes Among Patients with Coronavirus Disease 2019 (COVID-19) — CDC eam, United States, February 12–March 16, 2020



Age
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Of those with symptomatic infection

~96%	Mild
~2.8%	Severe
~1.2%	Critical

del Parameters

arameter	Value*(range)	S
roportion of cases that are asymptomatic	75%	[1], [2], [3]
Mild to moderate cases among the symptomatic	(95.64%, 96.78%)	
evere cases among the symptomatic	(2.46%-3.64%)	[5]
ritical cases among the symptomatic	(1.16%-1.45%)	
roportion of cases that are fatal	(0.30%, 0.412%)	[4], [5]
ime from infection to onset of infectiousness	4 days (2·0-9·0)	
ime from onset of infectiousness to onset of symptoms	2 days (1·0-4·0)	
uration of infectiousness from onset of symptoms	5 days	
ime from onset of mild symptoms to testing	4 days (2.0-4.0)	[4], [6], [7],
ime from onset of symptoms to hospitalisation	5 days (4·0–8·0)	with input f
ime from onset of symptoms to ICU admission	9 days (8·0–17·0)	NICD data.
uration of hospital stay	12 days (7·0–16·0)	
uration from ICU admission to discharge	18 days (14·0–18·0)	
uration from ICU admission to death	5 days (4.0-7.0)	

ues have been selected for use by an expert panel of clinicians on the SA Covid-19 Modelling Consortium. Ranges are inform
population age structure in South Africa [11].

nces

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Republic of South Africa

South African Government

www.gov.za

Let's grow South Africa together

Minister Zweli Mkhize confirms total of 726 823 cases of Coronavirus COVID-19

1 Nov 2020

As of today, the cumulative number of detected COVID-19 cases is 726 823 with 1 371 new cases identified since the last report.

Province	Total cases for 1 November 2020	Percentage total
Eastern Cape	97021	13,3
Free State	57058	7,9
Gauteng	228948	31,5
KwaZulu-Natal	123257	17,0
Limpopo	17624	2,4
Mpumalanga	29865	4,1

North West	33451	4,6
Northern Cape	22007	3,0
Western Cape	117592	16,2
Unknown	0	0,0
Total	726823	100,0

The cumulative number of tests conducted to date is 4 842 516 with 19 543 new tests conducted since the last report.

Sector	Total tested		New tested	
PRIVATE	2 783 237	57%	12 151	62%
PUBLIC	2 059 279	43%	7 392	38%
Total	4 842 516		19 543	

Total Deaths and Recoveries

Regrettably, we report 135 COVID-19 related deaths today: 22 from Eastern Cape, 2 from the Free State, 107 from Gauteng, and 4 from Western Cape. This brings the total number of COVID-19 related deaths to 19 411. Of the 135 deaths reported today, 8 were reported to have occurred in the past 24-48 hours: 1 in the Eastern Cape, 1 in the Free State, 3 from Gauteng, and 3 in Western Cape.

We extend our condolences to the loved ones of the departed and thank the healthcare workers that treated the deceased patients.

Our recoveries now stand at 655 330 which translates to a recovery rate of 90%

Province	Total Deaths	Total Recoveries	Active Cases
Eastern Cape	3703	89815	3503
Free State	1509	42878	12671
Gauteng	4828	208385	15735
KwaZulu-Natal	3225	112920	7112
Limpopo	458	16588	578
Mpumalanga	605	28559	701
North West	452	29383	3616
Northern Cape	266	18087	3654
Western Cape	4365	108715	4512
National	19411	655330	52082

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Gauteng government sets up a quarantine site at Nasrec Expo Centre

Office of the Premier **2020/04/13 - 22:00**

Lerato Mailoane

Gauteng remains the epicentre of COVID-19 in South Africa and the Gauteng Provincial Government has set up various special sites that will help ease the pressure from health facilities and accommodate those who cannot self-isolate or quarantine at home.

One such site is the Nasrec Expo Centre, where Health MEC, Bandile Masuku conducted a walkabout at the facility which has a bed capacity of 2300 on Tuesday, 14 April 2020 to check its state of readiness as the facility will be one of the special sites in Gauteng that will be used as a facility for both quarantining and isolating COVID-19 cases in the province.

Masuku said the first phase will have 500 beds which will be increased for ICU cases.

"We are planning for the eventuality, that at its peak, the pandemic will get very bad," said Masuku.

According to Professor Salim Abdool Karim, Chairperson - Ministerial Advisory Group on COVID-19,there are going to be thousands of people needing medical care all at the same time. They are going to need the most complicated level of care that the province can provide, and as such advised that its best to be over prepared than under prepared

The MEC said the outcomes of the lockdown has given the country a steady increase in cases instead of an exponential one.

"We are happy the lockdown has given us a better chance of managing the spread of the pandemic and we are hoping some of the restrictions will continue throughout winter so as to further flatten the curve," added Masuku.

The Department has also updated its Mpilo App to help increase public education and awareness on COVID-19. The app also has a self-screening feature.

The app is available on both Android and IOS. Residents are encouraged to download it.

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MEDIA STATEMENT

THURSDAY, 25 FEBRUARY 2021

NASREC FIELD HOSPITAL TO CLOSE AT THE END OF FEBRUARY 2021

The Gauteng Provincial Government will close and decommission the Nasrec Field Hospital at the end of February 2021. This is due to the expansion of the public healthcare system that has seen 4265 functional beds being added and the evidence-based, scientific advice given by the provincial modelling team.

This was announced by the Gauteng MEC for Health Dr Nomathemba Mokgethi on Thursday, stating that there were no longer any scientific, statistical, or clinical reasons to keep the facility open.

"We have always been guided by science through the modelling team and by projections from the WHO in our comprehensive health response to the pandemic. The closure of Nasrec Field Hospital will not have a major impact in the treatment of COVID-19 patients. The Gauteng Department of Health now has the capacity to operationalize 4265 functional beds through its hospital infrastructure should the need arise," said MEC Mokgethi.

"Bed overload within hospital clusters will be managed through internal transfers between hospitals to relieve areas of shortage within clusters," assured the MEC.

The Nasrec Field hospital was initially secured in April last year as a 500-bed isolation and quarantine site to accommodate members of the public who could not self-isolate or quarantine at home. The facility was later extended to include 1000 beds to accommodate Priority 3 patients informed by projected infection peak in numbers anticipated for August 2020 emerging from modelling exercises at the time.

Later on the bed capacity was reduced by 500, while making options for re-scaling should a surge be realized. The bed capacity was reduced to 1000 beds.

Since opening 1658 patients were admitted at the Nasrec Field Hospital, broken into the following categories, 1254 for isolation, while 117 were admitted for quarantine and 287 Priority 3 patients to date.

To ensure value for money some of the materials and equipment from the Nasrec Field Hospital be will repurposed and used in other healthcare facilities.

MEC Mokgethi expressed gratitude to all staff members who worked at the facility and said setting-up such facility with tight deadlines provided many lessons for government in how to manage pandemic. "We got many testimonials and reassuring feedback from people that were treated at the facility thanks to the dedication shown by the team that was posted at the field hospital."

Ends

Issued by Gauteng Department of Health

For more information, contact

Motalatale Modiba, Head of Communication, 064 803 0808 or mediaenquiries@gauteng.gov.za

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X17

29 Dec 2020

Winde defends decision to close Cape Town Covid-19 field hospital after criticism

news24

Jan Gerber

0:00

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Western Cape Premier Alan Winde at the now closed Covid-19 field hospital.

Brenton Geach/Gallo Images via Getty Images

Western Cape Premier Alan Winde and his health MEC Nomafrench Mbombo defended the decision to close the field hospital at the CTICC.

This after opposition MPLs questioned the decision while the province is in the midst of a second wave of infections.

By the end of the week, the province will have an additional 744 beds which can be beefed up to 880.

Western Cape Premier Alan Winde and his Health MEC Nomafrench Mbombo have defended the provincial administration's decision to close the field hospital at the Cape Town International Convention Centre (CTICC).

On Tuesday, Western Cape legislature's Ad Hoc Committee on Covid-19 was briefed by Winde, Mbombo and head of the provincial health department Keith Cloete on the situational analysis of the pandemic in the province.

ANC MPL Cameron Dugmore, EFF MPL Melikhaya Xego and GOOD MPL Brett Herron all questioned the closure of the "Hospital of Hope", as the field hospital at the CTICC became known, in September as the province is currently experiencing a second wave of Covid-19 infections, **which the provincial administration has described as worse than the first wave**.

Winde said, when the infections flattened off in September, they first closed the Khayelitsha field hospital as the staff had to go back to the Eastern

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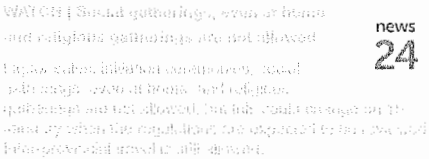
"We need to make a strategic decision around staffing."

He said the CTICC field hospital only ever reached 50% of capacity, and that they had built capacity at other existing facilities.

"Which makes more financial sense, makes much more practical sense, makes much more management sense," he added.

Mbombo, **who is not on leave despite her earlier social media post**, said while the CTICC field hospital was being used, the Brackengate field hospital, which is currently in use, and the other field hospitals were still being built.



Beds

She said apart from the other field hospitals, they have also converted other hospital beds for the treatment of Covid-19 patients.

"There is no need for the CTICC because we already converted more beds," she said.

She added that it is also easier for staff, who don't have to travel to the city centre.

Earlier on Tuesday, Winde said in a statement: "The Western Cape Government has done everything it can to add capacity to the system so it can cope, but it is still under extreme pressure because of the rapidly growing number of cases caused by the new variant."

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"To put it simply, the Western Cape will by the end of this week have added 744 additional beds into the system. We are also prepared to scale this up to 880 beds, which will be more than the CTICC field hospital capacity and which was only half full during the first wave."

He said they had decided this time to put additional beds in or near existing hospitals, to make more efficient use of healthcare workers and other resources, and to build the healthcare system for use well after Covid-19.

31 Dec 2021

CURRENCIES COMMODITIES JSE INDICES

Rand - Dollar	15.40	-0.3%
Rand - Pound	20.63	-0.1%
Rand - Euro	17.20	+0.2%
Rand - Aus dollar	11.19	-0.4%
Rand - Yen	0.13	-0.4%

All JSE data delayed by at least 15 minutes

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Hospital Admissions | Hospital Deaths

Location Selection

View Province

All South Africa

Please note:

Hospital admissions are shown at the provincial and district level *only*.

A report can be downloaded from the Welcome page.

Daily COVID-19 hospital-based deaths

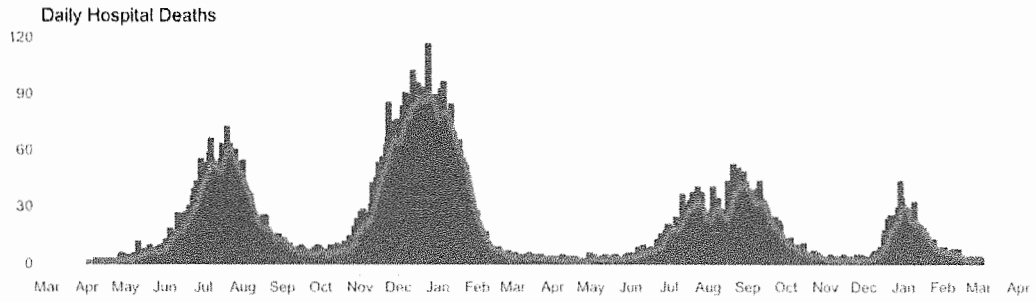
These plots show the number of daily hospital-based deaths for patients with a confirmed diagnosis and death due to COVID-19 at the provincial and district level. Daily deaths are depicted in dark red with the 7-day moving average shown in orange. These deaths are recorded in the DATCOV system and counts are by date of death, not date of reporting. Therefore daily hospital-based COVID-19 death counts will differ from the COVID-19 deaths reported by the National Department of Health.

Note on hospital data

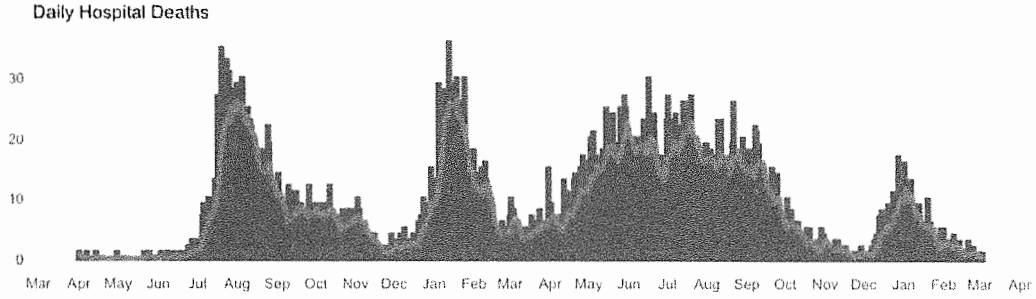
The number of reported confirmed COVID-19 deaths may change day-to-day as enrolled facilities back-capture historical data. At any given point in time, data on some discharges and deaths are in the process of being updated. Therefore, we only report data from at least three days ago to account for this. Furthermore, incomplete data submissions and delays in updating admission and outcome data on the DATCOV system could influence the interpretation of data.

The hospital data on the dashboard are reported until: 03 March 2022

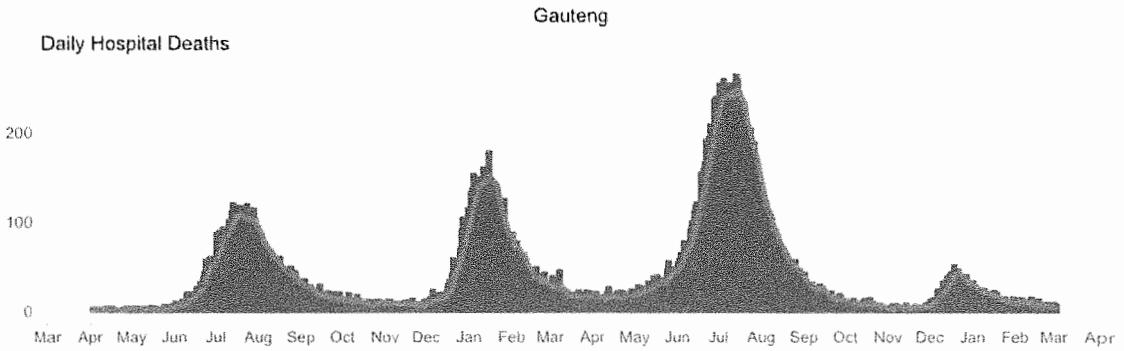
Eastern Cape



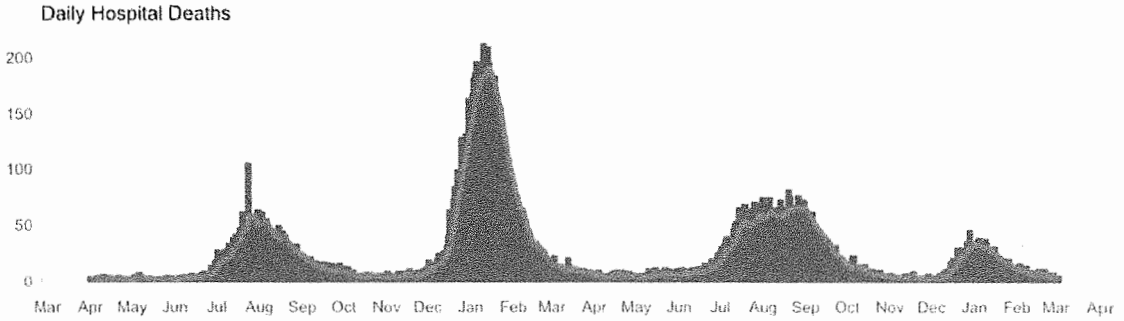
Free State



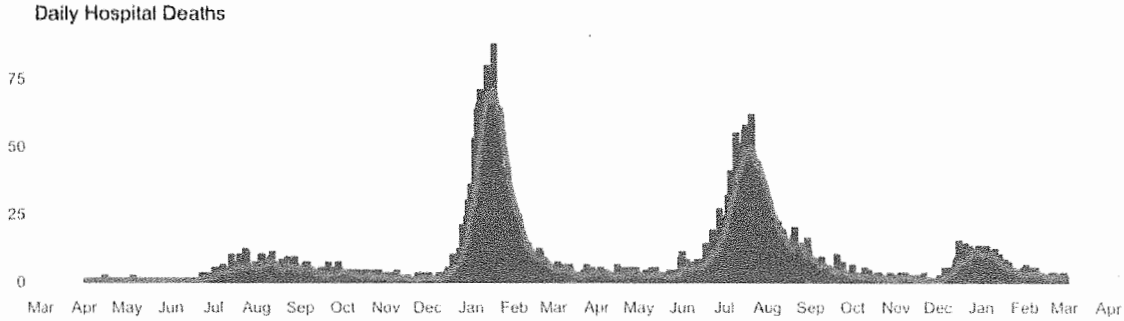
Gauteng



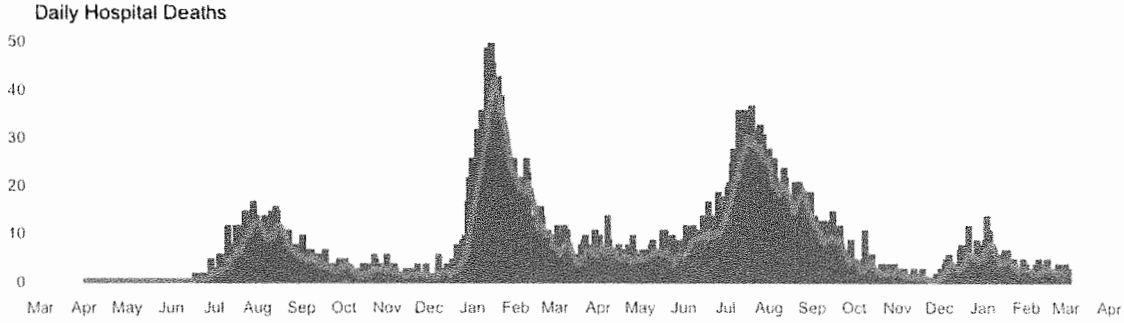
KwaZulu-Natal



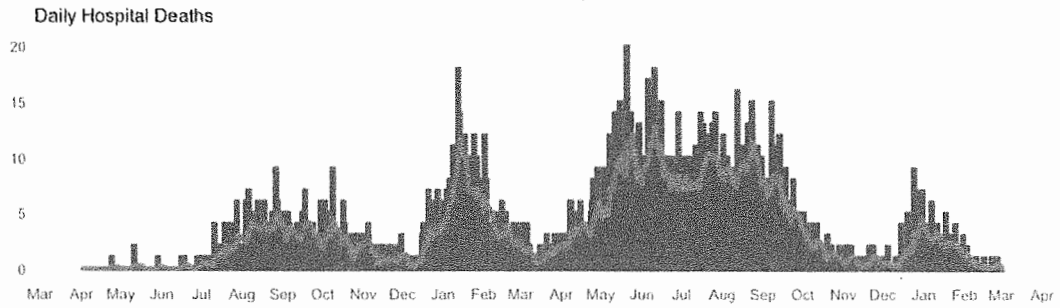
Limpopo



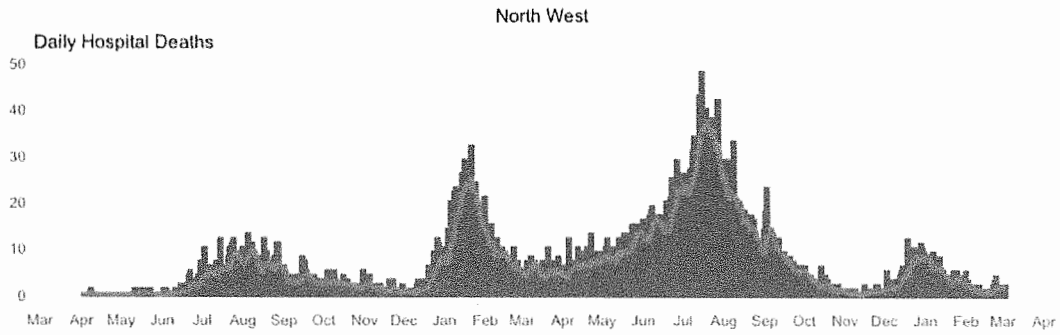
Mpumalanga



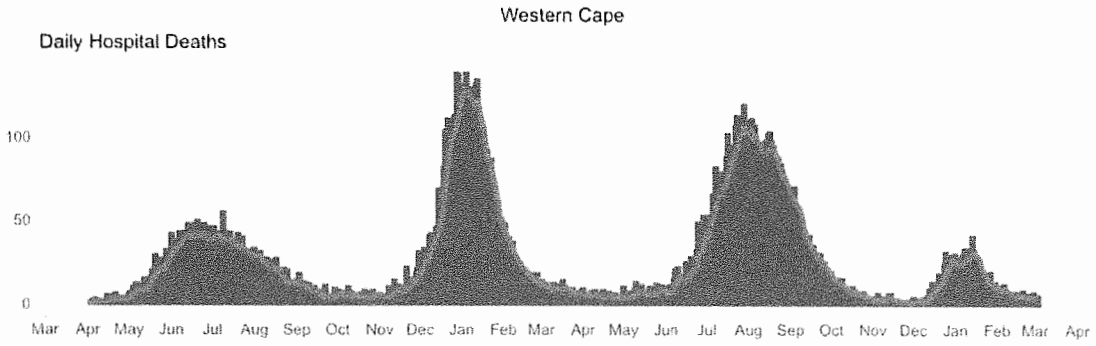
Northern Cape



North West



Western Cape



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Decreased severity of disease during the first global omicron variant covid-19 outbreak in a large hospital in tshwane, south africa

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ABSTRACT

INTRODUCTION: The coronavirus disease 2019 (COVID-19) first reported in Wuhan, China in December 2019 is a global pandemic that is threatening the health and wellbeing of people worldwide. To date there have been more than 274 million reported cases and 5.3 million deaths. The Omicron variant first documented in the City of Tshwane, Gauteng Province, South Africa on 9 November 2021 led to exponential increases in cases and a sharp rise in hospital admissions. The clinical profile of patients admitted at a large hospital in Tshwane is compared with previous waves.

METHODS: 466 hospital COVID-19 admissions since 14 November 2021 were compared to 3962 admissions since 4 May 2020, prior to the Omicron outbreak. Ninety-eight patient records at peak bed occupancy during the outbreak were reviewed for primary indication for admission, clinical severity, oxygen supplementation level, vaccination and prior COVID-19 infection. Provincial and city-wide daily cases and reported deaths, hospital admissions and excess deaths data were sourced from the National Institute for Communicable Diseases, the National Department of Health and the South African Medical Research Council.

RESULTS: For the Omicron and previous waves, deaths and ICU admissions were 4.5% vs 21.3% ($p<0.00001$), and 1% vs 4.3% ($p<0.00001$) respectively; length of stay was 4.0 days vs 8.8 days; and mean age was 39 years vs 49,8 years.

Admissions in the Omicron wave peaked and declined rapidly with peak bed occupancy at 51% of the highest previous peak during the Delta wave.

Sixty two (63%) patients in COVID-19 wards had incidental COVID-19 following a positive SARS-CoV-2 PCR test . Only one third (36) had COVID-19 pneumonia, of which 72% had mild to moderate disease. The remaining 28% required high care or ICU admission. Fewer than half (45%) of patients in COVID-19 wards required oxygen supplementation compared to 99.5% in the first wave. The death rate in the face of an exponential increase in cases during the Omicron wave at the city and provincial levels shows a decoupling of cases and deaths

compared to previous waves, corroborating the clinical findings of decreased severity of disease seen in patients admitted to the Steve Biko Academic Hospital.

CONCLUSION: There was decreased severity of COVID-19 disease in the Omicron-driven fourth wave in the City of Tshwane, its first global epicentre.

https://doi.org/10.1016/j.ijid.2021.12.357

INTRODUCTION

The coronavirus disease 2019 (COVID-19) first reported in Wuhan China in December 2019, is a global pandemic that is threatening the health and wellbeing of people worldwide. To date there have been more than 274 million reported cases and 5.3 million deaths (World Health Organisation 2021). South Africa has borne the brunt of COVID-19 on the African continent, registering in excess of 3 million cases and 90 000 officially reported deaths (National Department of Health 2021). The number of deaths could be as high as 275,976 (Bradshaw et al., 2021), putting this country's death toll among the highest in the world with a cumulative excess death rate of 464 per 100,000. South Africa is currently experiencing its fourth COVID-19 wave, being driven by the recently identified Omicron variant. Previous waves were associated with the Ancestral, Beta and Delta variants.

The City of Tshwane (incorporating Pretoria and surrounding areas just north of Johannesburg), with its population of 3.31 million people (Office of the Executive Mayor 2021) has had 241,794 cases of SARS-CoV-2, 35 090 hospital admissions and 7,086 deaths (National Institute for Communicable Diseases 2021) since the first COVID-19 admission at the Steve Biko Academic Hospital on 4 May 2020.

The first case of Omicron was documented in the City of Tshwane on 9 November 2021 (World Health Organization 2021). This was followed by a rapid rise in SARS-CoV-2 infections and COVID-19 associated hospitalisations from 14 November 2021, heralding the onset of the fourth wave in South Africa. Omicron rapidly displaced the Delta variant in the City of Tshwane and the Gauteng Province of South Africa (Network for Genomics Surveillance in South Africa (NGS-SA) 2021).

During the resurgence in Tshwane, we observed a difference in the clinical picture of COVID-19 ward patients compared with prior COVID-19 waves. We report from the first global epicentre of Omicron-driven resurgence on the patient profile of admissions to the Steve Biko Academic Hospital in Pretoria, the heart of the Tshwane District. In the current study, we compare the clinical profile of 466 COVID-19 patients admitted in the first 33 days since the commencement of the Omicron driven fourth wave with that of 3962 patients admitted during the 3 pandemic waves over the previous 18 months since May 2020 and provide a description of the clinical profile of 98 patients in the hospital at the peak of the Omicron wave on 14-15 December 2021.

METHODS

The Steve Biko Academic Hospital (SBAH) is an 800 bed tertiary academic hospital to which is attached the 240-bed Tshwane District Hospital and the University of Pretoria's Health Sciences Faculty. Sections of the hospital, including ICU, high care and general wards were repurposed for the management of adult and paediatric COVID-19 patients. This included areas in the Emergency Units, labour wards and theatres. All clinical departments provided both staff and services to the COVID-19 areas as required.

At the beginning of the pandemic in March 2020, a national hospital admissions surveillance system (DATCOV) was established by the National Institute of Communicable Diseases (NICD). Hospital level data were extracted from the COVID-19 hospital surveillance system for patients admitted to the Steve Biko Academic Hospital (SBAH) from 4 May 2020 to 16 December 2021. These hospital records were reviewed for a comparison between patients admitted during the Omicron wave and previous waves. All patients were included in the sample.

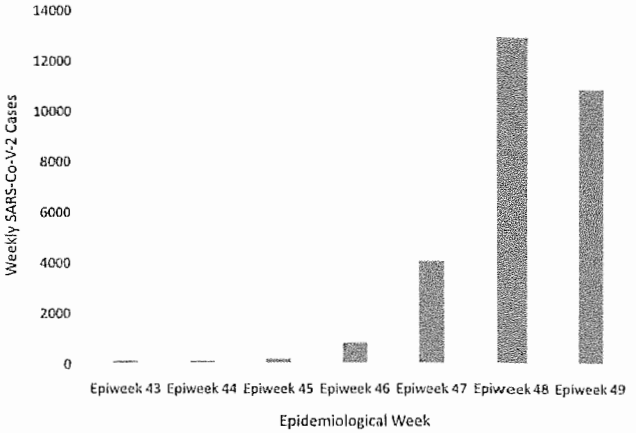

Figure 1. Weekly number of SARS-CoV-2 cases in Tshwane District, 24 October through 11 December 2021 (NICD)

466 records from DATCOV of patients admitted during the Omicron wave were compared to all 3962 records of patients admitted during three previous waves over a period of 18 months. In addition, a snapshot analysis of 98 records of patients occupying COVID-19 beds in the hospital at peak bed occupancy were reviewed for severity of illness, primary indication for admission, oxygen supplementation level, self-reported vaccination and prior COVID-19 infection status. These data were entered into the internal hospital information system. Oxygen supplementation levels for 588 patients admitted to the hospital during the first wave were reviewed (Boswell et al., 09 December 2021).

The record files of 21 deceased patients for the period 14 November through 16 December 2021 were requested from the hospital registries and reviewed for cause of death.

Hospital COVID-19 bed occupancy was obtained from daily statistics captured by the Nursing Services Manager responsible for bed management at the facility.

Data for the city and province-wide cases, deaths and hospital admissions were provided by the NDOH (National Department of Health 2021) and the NICD (National Institute for Communicable Diseases 2021). Data analysis was done using Excel and STATA 16. Data smoothing was performed using LOWESS in STATA 16 (Stata/IC 16 2020).

RESULTS

There was an exponential increase in SARS-CoV-2 infections in the City of Tshwane, commencing in the week of 7 November 2021 as shown in Figure 1, reaching 11 010 cases in the week of 28 November 2021 and peaking in the week of 5 December 2021.

The highest single day occupancy of COVID beds during the Omicron wave was 108 on 13 December 2021, much lower than the highest level of COVID bed occupancy over previous waves, which was 213 beds occupied on 13 July 2021 at the peak of the Delta wave.

There were 466 admissions to the COVID-19 wards between 14 November and 16 December 2021 compared to 20 admissions in the preceding two weeks, showing the rapid rise in hospital admissions during this period (Figure 2).

Table 1 compares 466 patients admitted during the Omicron wave and 3962 during previous waves, showing significant differences in the age distribution, outcomes, level of care required, and length of hospital stay. Mean age was significantly lower (39 vs

NICD, National Institute of Communicable Diseases (South Africa); NDOH, National Department of Health (South Africa); SAMRC, South African Medical Research Council; SBAH, Steve Biko Academic Hospital; UP, University of Pretoria.

Table 1
Description of COVID-19 admissions at Steve Biko Academic Hospital Complex, fourth wave compared to previous waves

INDICATORS	14/11/21 – 16/12/21 n(%) or mean(SD)	4/5/2020-13/11/21 n(%) or mean(SD)	TEST PARAMETER	SIGNIFICANCE LEVEL
# Admissions	466	3962		
Mean age	39(22.4)	49.8(21.8)	t= - 10.2	p< 0.00001
Proportions in age groups				
0-9	62(13.3)	284(7.17)	z= 5.1	p< 0.00001
10-19	17(3.7)	91(2.3)	z = 2	P = 0.044
20-29	83(17.8)	255(6.4)	z=8.8	p< 0.00001
30-39	105(22.5)	551(13.9)	z=5.1	p< 0.00001
40-49	49(10.5)	582(14.7)	z= - 1.9	p = 0.15
<50	316(67.8)	1763(44.5)	Z=8.9	p< 0.00001
>=50	150(32.2)	2169(54,7)	Z=-8.9	p< 0.00001
50-59	41(8.8)	757(19.1)	z = -5.5	p< 0.00001
60-69	68(14.6)	797(20.1)	z= -2.7	P = 0.0061
70+	41(8.8)	615(15.5)	z= -5.1	p< 0.00001
Unknown	0 (0)	30 (0.8)		
Length of stay	4.0(3.7)	8.8(19)	t = - 5.4	p< 0.00001
ICU	5(1%)	172(4.3%)	z= -3.4	P 0.0007
Deaths	21(4.5%)	847(21.3%)	z= - 8.7	P< 0.00001

Table 2
Levels of oxygen supplementation for COVID pneumonia patients at Steve Biko Academic Hospital Complex 14-15 December 2021

Oxygen Supplementation	Mo[illegible]	Prongs	Oxygen Mask	Oxygen Nasal Prongs+	Face Mask	High Flow Nasal Oxygen	Invasive Ventilation	Mechanical Ventilation	TOTAL
Confirmed COVID Pneumonia	5 (14%)	8 (22%)	1(3%)		1 (3%)	4 (11%)	4 (11%)		36 (100%)

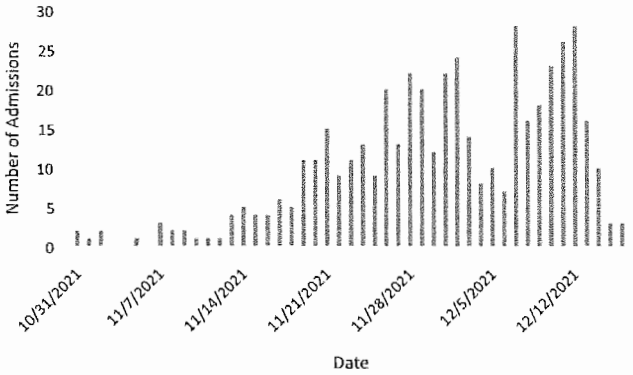

Figure 2. Daily number of COVID-19 hospital admissions for Steve Biko Academic Hospital, 31 October to 16 December 2021

49.8 years), most admissions were in the 30 – 39 year age group, 68% of admissions were for those below age 50 compared to 44.5% previously, and the proportion of admissions in 0-9 year old age group doubled.

There were 21 (4.5%) hospital deaths compared to 847 (21.3%) and 5 (1%) ICU admissions compared to 172 (4.3%) in the Omicron wave compared to previous waves. Length of hospital stay was significantly shorter (4.0 days) in the Omicron wave compared to 8.8 days in previous waves.

A cause of death analysis for 21 deceased patients in the Omicron wave at the hospital showed COVID-19 with a confirmed COVID pneumonia as the cause of death in 10 (48%) patients, another cause exacerbated by COVID pneumonia in 4 (19%), and a cause unrelated to COVID pneumonia in 7 (33%).

Figure 3 and Table 2 show clinical severity of 98 patients in the COVID wards on 14-15 December 2021.

Thirty-six patients (37%) had a confirmed diagnosis of COVID pneumonia, of which 31 (86%) required oxygen supplementation.

Sixty-two (63%) patients were incidental COVID admissions, having been admitted for another serious primary medical, surgical, obstetric or psychiatric diagnosis. These cases have been labelled 'incidental COVID' as they were diagnosed as the result of hospital admission procedures, rather than having the typical clinical profile or meeting a case definition for COVID-19. This phenomenon of 'incidental COVID' is not a phenomenon observed before in South Africa and most likely reflects high levels of asymptomatic disease in the community with Omicron infection. As all patients being admitted to the hospital are tested for SARS-CoV-2 as per the policy, those testing positive are admitted to the designated COVID wards.

Fifty-four patients (55%) coped on room air without supplemental oxygen. Fewer than half (45%) of patients in COVID-19 wards compared to 99.5% (Boswell et al., 09 December 2021) in the first wave required oxygen supplementation.

Table 2 shows the level of oxygen supplementation as an index of severity among patients with COVID-19 pneumonia of whom 26 (72%) required no or low levels of oxygen supplementation. Ten patients (28%) required high care or ICU admission. Among the 4 ICU admissions, 3 patients exhibited features of a COVID-19 pneumonia, however only 1 patient required invasive mechanical ventilation primarily for COVID-19 associated respiratory failure. One (1) patient required invasive mechanical ventilation for confirmed pneumonia with severe COPD and cardiogenic shock in the Emergency Care Unit. The six paediatric admissions to paediatric high care/ICU were attributed to diagnoses unrelated to COVID-19.

The Emergency Medical Unit in the SBAH complex reported a marked decline in the use of reticulated oxygen volumes compared to previous waves.

Among 55 pregnant women admitted to the COVID-19 labour ward only 2 required face-mask oxygen, mirroring the 'incidental COVID-19' picture seen in the adult and paediatric COVID-19 wards. One of these two patients had a mild COVID-19 pneumonia requiring supplemental oxygen for 3 days. The second required supplemental oxygen for a diagnosis unrelated to COVID-19.

The findings described above for the Steve Biko Academic Hospital were comparable to city-wide trends when cases and admissions from all public and private hospitals reported in the national hospital surveillance system were observed. The data from the NICD DATCOV database showed that there was a total of 33,643 SARS-CoV-2 cases, 3,233 COVID-19 hospitalisations and 130 deaths

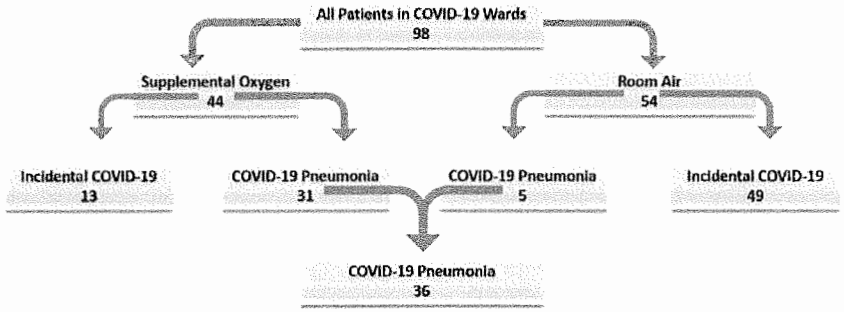

Figure 3. Tree diagram showing COVID-19 disease severity in patients at the Steve Biko Academic Hospital on 14-15 December 2021

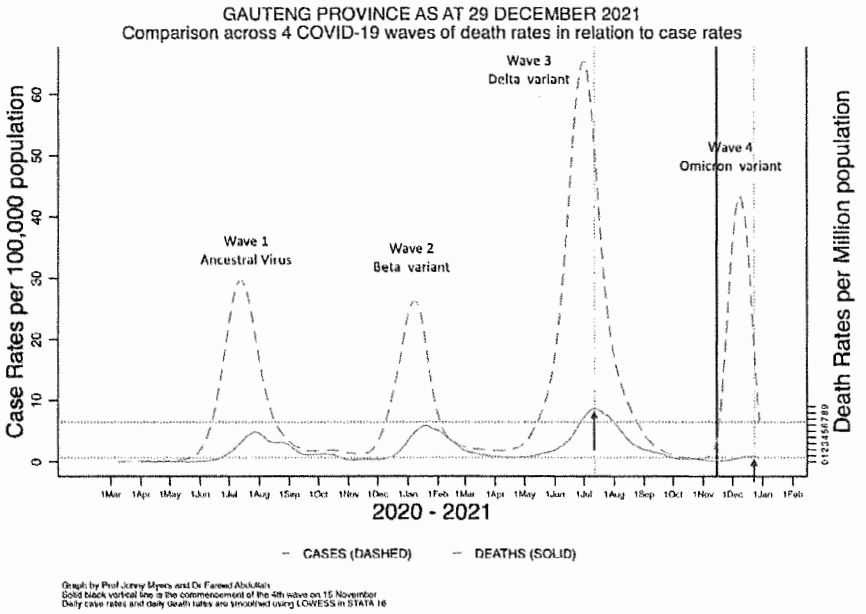

Figure 4. COVID-19 cases and reported deaths rates for the Gauteng Province (National Department of Health 2021)

reported in the City of Tshwane in the same period (14 November to 16 December 2021), reflecting a lower admission per case ratio, lower death rate and lower rates of admission to the ICU compared to previous waves.

Figure 4 further shows an uncoupling of the case and death rates for the Gauteng Province as a whole, confirming the local hospital experience of significantly fewer admissions to the ICU and deaths compared to previous waves.

DISCUSSION

As it has been demonstrated elsewhere that the Omicron variant rapidly displaced Delta in the region in which this study was conducted (Viana et al., 2021), the assumption that the clinical profile described in this paper represents disease caused by the Omicron variant is reasonable. The Omicron outbreak has spread and declined in the City of Tshwane with unprecedented speed, peaking within 4 weeks of its commencement. Hospital admissions increased rapidly and began to decline within a period of 33 days. This demonstrates a significantly different transmission trajectory and epidemiological profile from that of previous variants of concern and can be expected to be replicated in other parts of the world.

Peak bed occupancy was about half that of the third (Delta) wave suggesting a lower rate of hospital admissions relative to the number of cases in the Omicron wave compared to previous waves. The mean age of hospitalized patients in the Omicron wave was 11 years younger than previous waves and may reflect the higher rate of vaccination in the elderly population. Fewer ICU admissions and deaths and a shorter length of hospital stay indicate decreased severity of disease caused by the Omicron variant. A third of deaths resulted from a cause other than COVID-19, and there were no paediatric deaths related to severe COVID-19 disease. Sixty three percent of COVID-19 patients in the snapshot at peak bed occupancy were in hospital for an alternative primary diagnosis, and were 'incidental COVID' patients as they were diagnosed as the result of hospital admission procedures, rather than having the typical clinical profile or meeting a case definition for COVID. This phenomenon has not been observed to this extent before in the Steve Biko Academic Hospital or anywhere in South Africa and most likely reflects high levels of asymptomatic disease in the community with Omicron infection.

The low percentage of patients in the COVID-19 wards with a confirmed diagnosis of COVID-19 pneumonia has implications for the application of clinical skill and expertise being deployed to the COVID-19 wards, with all specialties required to manage their 'incidental COVID' patients under COVID-19 infection control standards. It also implies much lower oxygen utilization levels in the COVID-19 wards. The categorization of patients into 'incidental SARS-CoV-2' and moderate to severe COVID-19 disease may lead to a radically different internal organization of COVID-19 wards at the hospital.

A similar profile of patients is being seen in COVID-19 wards in the Western Cape Province of South Africa (Mendelsohn et al., 2021) and reports of similar patterns of the clinical profile of patients have been described by one of South Africa's largest private hospital groups (Maslo, 2021).

The changing clinical presentation of SARS-CoV-2 infection is likely due to high levels of prior infection and vaccination coverage in this setting. The estimated seroprevalence of immunity from prior infection and vaccine induced immunity for the City of Tshwane is 66.7% (95% CI, 54.2 to 69.0) (Madhi Shabir et al., 2021). About 36% of adults aged 18 to 49 and 58% over age 50 in the Gauteng Province are vaccinated. Another plausible cause for the lower number of admissions and decreased severity is a decrease in pathogenicity or virulence of the highly mutated Omicron variant, though more research is required to fully establish this theory.

A similar pattern is likely to emerge in other provinces in South Africa as Omicron spreads rapidly across the country, but may differ in countries where levels of hybrid immunity or the mix of immunity from prior infection and vaccination are different.

Limitations of the study include the inability to compare the Omicron wave to each of the three previous waves separately due to the difficulty of defining the beginning and end dates of previous waves. Another limitation of the study is that it was unable to compare clinical parameters of patients in the COVID-19 wards across waves due to poor electronic record-keeping of these parameters, including clinician evaluations, chest-xray finding and blood biomarkers for COVID-19 disease.

CONCLUSION

There was decreased severity of disease in the Omicron-driven fourth wave in the City of Tshwane, its first global epicentre, with fewer deaths, ICU admissions and a shorter length of hospital stay. The younger age profile of patients is likely to have been a factor of this clinical profile.

The wave increased at a faster rate than previous waves, completely displacing the Delta variant within weeks and began its decline in both cases and hospital admissions in the fifth week following its commencement.

There are clear signs that case and admission rates in South-Africa may decline further over the next few weeks. If this pattern continues and is repeated globally, we are likely to see a complete decoupling of case and death rates, suggesting that Omicron may be a harbinger of the end of the epidemic phase of the Covid pandemic, ushering in its endemic phase.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Sources

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Ethics Approval

Ethics approval was granted by the University of the Witwatersrand (DATCOV MED2010093) and the University of Pretoria's Research Ethics Committee (637/2020).

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijid.2021.12.357.

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ORIGINAL ARTICLE

Population Immunity and Covid-19 Severity with Omicron Variant in South Africa

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Abstract

BACKGROUND

The B.1.1.529 (omicron) variant of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified on November 25, 2021, in Gauteng province, South Africa. Data regarding the seroprevalence of SARS-CoV-2 IgG in Gauteng before the fourth wave of coronavirus disease 2019 (Covid-19), in which the omicron variant was dominant, are needed.

METHODS

We conducted a seroepidemiologic survey from October 22 to December 9, 2021, in Gauteng to determine the seroprevalence of SARS-CoV-2 IgG. Households included in a previous seroepidemiologic survey (conducted from November 2020 to January 2021) were contacted; to account for changes in the survey population, there was a 10% increase in the households contacted, with the use of the same sampling framework. Dried-blood-spot samples were tested for IgG against SARS-CoV-2 spike protein and nucleocapsid protein with the use of quantitative assays. We also evaluated Covid-19 epidemiologic

trends in Gauteng, including cases, hospitalizations, recorded deaths, and excess deaths from the start of the pandemic through January 12, 2022.

RESULTS

Samples were obtained from 7010 participants, of whom 1319 (18.8%) had received a Covid-19 vaccine. The seroprevalence of SARS-CoV-2 IgG ranged from 56.2% (95% confidence interval [CI], 52.6 to 59.7) among children younger than 12 years of age to 79.7% (95% CI, 77.6 to 81.5) among adults older than 50 years of age. Vaccinated participants were more likely to be seropositive for SARS-CoV-2 than unvaccinated participants (93.1% vs. 68.4%). Epidemiologic data showed that the incidence of SARS-CoV-2 infection increased and subsequently declined more rapidly during the fourth wave than it had during the three previous waves. The incidence of infection was decoupled from the incidences of hospitalization, recorded death, and excess death during the fourth wave, as compared with the proportions seen during previous waves.

CONCLUSIONS

Widespread underlying SARS-CoV-2 seropositivity was observed in Gauteng before the omicron-dominant wave of Covid-19. Epidemiologic data showed a decoupling of hospitalizations and deaths from infections while omicron was circulating. (Funded by the Bill and Melinda Gates Foundation.)

Introduction

The B.1.1.529 (omicron) variant of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified on November 25, 2021, in Gauteng province, South Africa.[1] The World Health Organization designated omicron as a variant of concern because of its predicted high transmissibility and its potential to evade immunity from neutralizing antibodies induced by vaccination or natural infection with wild-type virus.[2] The omicron variant contains mutations that indicate that it could be more infectious, more transmissible, and possibly better able to evade innate immunity and neutralizing antibody activity than wild-type virus.[3-5] In addition to having at least 32 mutations affecting the spike protein,[6] the omicron variant harbors 3 mutations involving the membrane protein and 6 involving the nucleocapsid protein, whereas the antibody-evasive B.1.351 (beta) variant has only 7 spike-protein mutations and 1 nucleocapsid-protein mutation.[7]

The omicron variant outcompeted the B.1.617.2 (delta) variant in Gauteng and was responsible for 98.4% of new cases sequenced in South Africa in December 2021.[8] This fourth wave of coronavirus disease 2019 (Covid-19) arose in the context of the rollout of Covid-19 vaccines, which began on May 17, 2021, in South Africa. We previously conducted a population-wide seroepidemiologic survey in Gauteng that was completed on January 22, 2021.[9] We found that 19.1% of the population was seropositive for SARS-CoV-2, as assessed by the detection of IgG against the receptor-binding domain; the seroprevalence ranged from 5% to 43% across provincial subdistricts.[9] After that survey was completed, South Africa faced a third wave of Covid-19, from approximately April 7 to November 1, that was largely due to the delta variant, which outcompeted the beta variant.[10]

We report the results of a follow-up seroepidemiologic survey in Gauteng that was completed on December 9, 2021, and thus provides seroprevalence data largely from before the fourth wave of Covid-19. Furthermore, we report data regarding Covid-19 epidemiologic trends in Gauteng, including cases, hospitalizations, recorded deaths, and excess deaths from the start of the pandemic through January 12, 2022.

Methods

STUDY SETTING

Gauteng is divided into five health districts (Johannesburg, Ekurhuleni, Sedibeng, Tshwane, and West Rand) that comprise 26 subdistricts.[11] Gauteng constitutes 1.5% of the landmass in South Africa but contains 26% of the population (15.5 of 59.6 million persons).[11] The overall population density in Gauteng is 737 persons per square kilometer, with the value ranging from 3400 in Johannesburg, where 36.9% of the population lives, to 200 in West Rand, where 6.2% of the population lives (Table S1 in the **Supplementary Appendix**, available with the full text of this article at NEJM.org).

STUDY SURVEY

This survey included the same households that were sampled during our previous survey, which was undertaken from November 4, 2020, to January 22, 2021.[9] The previous survey was started 9 weeks after the onset of the second wave of Covid-19 in Gauteng, which was dominated by the beta variant. Details regarding the previous survey, including the sampling framework used, have been published[9] and are summarized in the Supplementary Methods section of the **Supplementary Appendix**.

This survey was conducted from October 22 to December 9, 2021. To account for possible nonparticipation, out-migration, and death since the previous survey, there was a 10% increase in the households that were sampled; the additional households were sampled in the same clusters used previously. The survey was powered to evaluate seropositivity for SARS-CoV-2 at the district and subdistrict levels. Demographic and epidemiologic data were collected with the use of an electronic questionnaire.[9] Details regarding the questionnaire are provided in the **Supplementary Appendix**.

The Human Research Ethics Committee at the University of the Witwatersrand granted a waiver for ethics approval of the survey, which was performed at the behest of the Gauteng Department of Health as part of public health surveillance. Nevertheless, all participants provided written informed consent; those who were approached to participate were free to decline participation. The authors designed the study, collected and analyzed the data, and vouch for the completeness and accuracy of the data and the fidelity of the study to the protocol. The authors wrote the manuscript; no one who is not an author contributed to the writing of the manuscript.

SEROLOGIC ANALYSIS

Dried-blood-spot samples were obtained from participants and tested for IgG against SARS-CoV-2 spike protein and nucleocapsid protein with the use of quantitative assays on the Luminex platform. Anti-nucleocapsid IgG was included to identify persons who were seropositive from natural infection rather

than vaccination. Details regarding the serologic assays have been published[12,13] and are summarized in the **Supplementary Appendix**.

COVID-19 DATA SOURCES

Data regarding daily cases, hospitalizations, and recorded deaths were sourced from the South African National Institute for Communicable Diseases daily databases, including the DATCOV database, through January 12, 2022.[14,15] Data regarding weekly excess deaths attributable to Covid-19 were defined by and sourced from the South African Medical Research Council through January 8, 2022.[16] We analyzed these epidemiologic data for Gauteng and its five health districts, both overall and with stratification according to age group and sex when granular data were available.

Cases included asymptomatic and symptomatic infections with SARS-CoV-2 confirmed by either a nucleic acid amplification assay or a rapid antigen test. Hospitalizations included admissions for SARS-CoV-2 infection, as well as admissions for other illnesses in which SARS-CoV-2 infection was incidentally identified on routine screening at the time of admission. Definitions of recorded death and excess death attributable to Covid-19 are provided in the **Supplementary Appendix**.

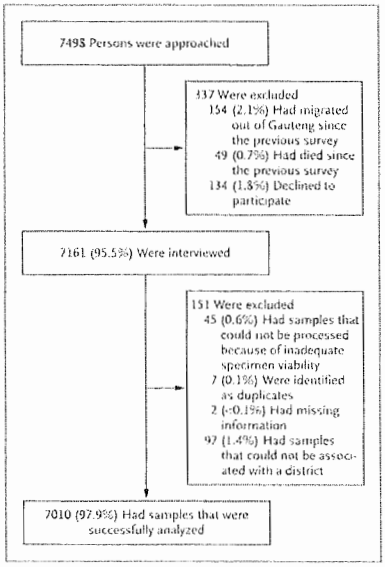
STATISTICAL ANALYSIS

The sample-size justification and the methods for repeated random sampling of households that were used in our previous survey have been published[9] and are summarized in the **Supplementary Appendix**, together with the methods for analyses of associations with seropositivity, which were performed with the use of generalized linear models with log link to estimate risk ratios. These were unadjusted, univariable analyses for each risk factor. Data regarding daily cases, hospitalizations, and recorded deaths and weekly excess deaths were converted to incidences with the use of population denominators from Statistics South Africa mid-2020 projections for South Africa and its provinces.[11]

Results

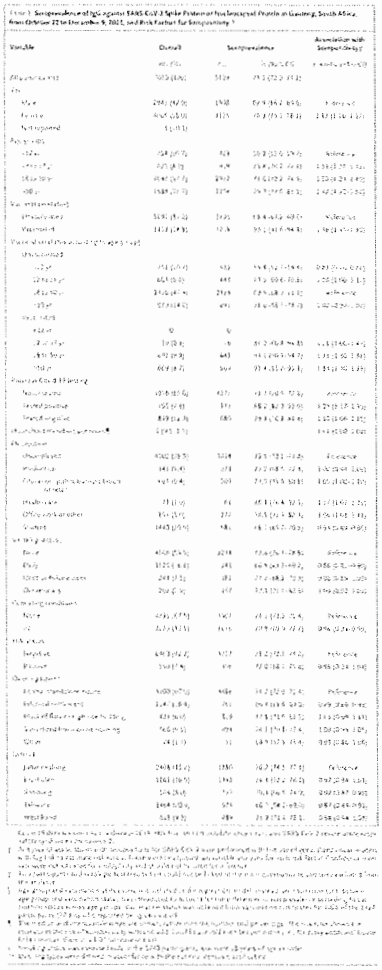
PARTICIPANTS

Figure 1.



Survey Participants.

Table 1.



Seroprevalence of IgG against SARS-CoV-2 Spike Protein or Nucleocapsid Protein in Gauteng, South Africa, from October 22 to December 9, 2021, and Risk Factors for Seropositivity.

We obtained samples that were adequate for serostatus evaluation from 7010 of 7498 participants from 3047 households (**Figure 1**); 83% of the samples had been obtained by November 25, 2021, when the

omicron variant was first identified (Fig. S1). Demographic and household characteristics, known underlying medical conditions and participant-reported human immunodeficiency virus status, and vaccination status of the survey participants are shown in **Table 1**. The degree to which the survey population was representative of the general population of Gauteng and of South Africa is described in Table S2. Vaccination in Gauteng according to district, age, and vaccine is summarized in Table S3. As of November 25, 2021, of the total population of 12,191,569 persons 12 years of age or older (who were eligible for vaccination), 4,386,646 (36.0%) had received at least one dose of BNT162b2 or Ad26.COV2.S, and 2,452,017 (20.1%) had received two doses. Of the 2,416,045 persons older than 50 years of age, 1,074,303 (44.5%) had received two doses of BNT162b2.

SEROPREVALENCE

Among unvaccinated participants, the overall prevalence of anti-spike or anti-nucleocapsid IgG seropositivity was 68.4% (95% confidence interval [CI], 67.2 to 69.6), whereas the prevalence of anti-nucleocapsid IgG seropositivity was 39.7% (95% CI, 38.4 to 41.0), a finding that indicates a lack of sensitivity of anti-nucleocapsid IgG for the detection of previous infection. We thus focused on the overall prevalence of anti-spike or anti-nucleocapsid IgG seropositivity.

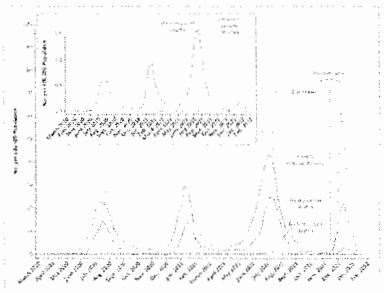
Among all participants, the overall seroprevalence was 73.1% (95% CI, 72.0 to 74.1) (**Table 1**). The seroprevalence was heterogeneous across provincial districts, ranging from 66.7% (95% CI, 54.2 to 69.0) in Tshwane, where the omicron variant was first identified, to 76.2% (95% CI, 74.5 to 77.8) in Johannesburg (Fig. S2). In addition, the seroprevalence was heterogeneous across subdistricts, ranging from 72.7% to 85.8% within Johannesburg and from 58.9% to 77.4% within Tshwane (Table S4).

Female participants were more likely to be seropositive than male participants (76.9% vs. 67.9%; risk ratio, 1.13; 95% CI, 1.10 to 1.17). The seroprevalence varied according to age group; it was lowest among children younger than 12 years of age (56.2%) and highest among adults older than 50 years of age (79.7%). Children 12 to 17 years of age were more likely to be seropositive than children younger than 12 years of age (73.8% vs. 56.2%; risk ratio, 1.31; 95% CI, 1.21 to 1.42). Participants who had received a Covid-19 vaccine were more likely to be seropositive than unvaccinated participants (93.1% vs. 68.4%; risk ratio, 1.36; 95% CI, 1.33 to 1.39). Among vaccinated participants, the seroprevalence was consistently high across age groups; among adults 18 to 50 years of age, those who were vaccinated had a higher seroprevalence than those who were unvaccinated.

Participants who had previously tested positive for SARS-CoV-2 infection were more likely to be seropositive than participants who had never been tested (88.2% vs. 71.7%; risk ratio, 1.23; 95% CI, 1.17 to 1.30). Participants living in an informal settlement had a lower seroprevalence than participants living in a standalone house (66.3% vs. 74.2%; risk ratio, 0.89; 95% CI, 0.86 to 0.93). Daily smoking was associated with a lower seroprevalence than was not smoking (66.5% vs. 77.6%; risk ratio, 0.86; 95% CI, 0.82 to 0.90).

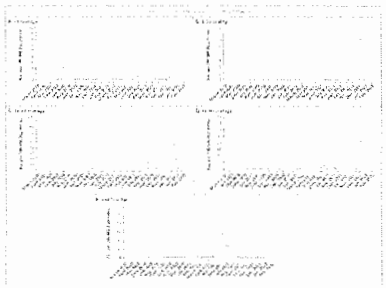
COVID-19 TRENDS

Figure 2.



Cases, Hospitalizations, Recorded Deaths, and Excess Deaths Attributable to Covid-19 in Gauteng, South Africa, from the Start of the Pandemic through January 12, 2022.

Figure 3.

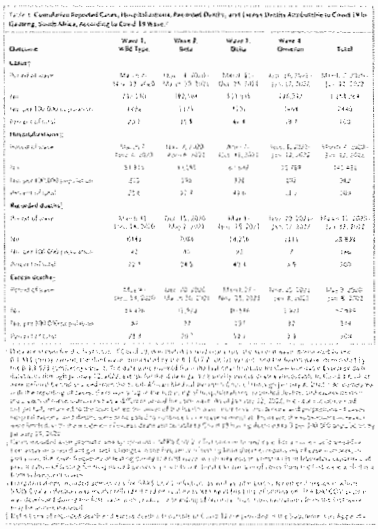


Covid-19 Cases, Hospitalizations, and Recorded Deaths in Gauteng, South Africa, According to Age Group.

Daily cases, weekly hospitalizations, daily recorded deaths, and weekly excess deaths attributable to Covid-19 in Gauteng are shown in **Figure 2.** Daily cases, hospitalizations, and recorded deaths are also shown with stratification according to age group (**Figure 3**) and according to sex (Fig. S3).

During the fourth wave of Covid-19, in which the omicron variant was dominant, the daily case incidence increased more rapidly and also appeared to be decreasing more quickly than it had during the three previous waves (**Figure 2**). The time from the onset to the peak of the wave was 1 month in the fourth wave, as compared with 2 months in the third wave. As of January 12, 2022, the case incidence had not yet fully returned to the level before the onset of the fourth wave, but the wave was nearing its end, on the basis of the trajectory shown in **Figure 2.** At that time, there were almost no recorded or excess deaths attributable to Covid-19 per 100,000 population.

Table 2.



Cumulative Reported Cases, Hospitalizations, Recorded Deaths, and Excess Deaths Attributable to Covid-19 in Gauteng, South Africa, According to Covid-19 Wave.

The number of documented Covid-19 cases in the fourth wave (226,932) was higher than that in the second wave (182,564) and lower than that in the third wave (511,638), whereas the incidences of hospitalization, recorded death, and excess death attributable to Covid-19 in the fourth wave were consistently lower than the incidences in earlier waves (**Table 2**). In addition, the peak incidences of hospitalization, recorded death, and excess death in the fourth wave were lower than the peak incidences in previous waves. The fourth wave contributed 11.2%, 3.9%, and 3.3% of overall hospitalizations, recorded deaths, and excess deaths due to Covid-19, respectively, whereas the third wave, in which the delta variant was dominant, contributed 43.6%, 49.3%, and 52.7%. Similar trends were observed across all districts (Fig. S4). Although there is a lag in the reporting of weekly excess deaths, the incidence in the fourth wave as of January 8, 2022 (12 per 100,000 population), was lower than the incidence in the third wave (197 per 100,000 population). As of January 12, 2022, incidences were on an ongoing downward trajectory, with a 7-day moving average of 7.28 cases, 0.96 hospitalizations, and 0.11 recorded deaths per 100,000 population — a decrease by a factor of 9.3, 3.3, and 2.4 from the peak incidence of 67.56 cases, 3.18 hospitalizations, and 0.26 recorded deaths per 100,000 population, respectively. The incidences were nearing prewave levels (as of October 25, 2021) of 0.46 cases, 0.15 hospitalizations, and 0.04 recorded deaths per 100,000 population.

During the fourth wave, decreased incidences of hospitalization and recorded death were evident across all age groups older than 17 years and among both men and women. The incidences of hospitalization and recorded death among children 17 years of age or younger, which have consistently been markedly lower than the incidences in older age groups, were similar to the incidences during earlier waves, except for a lower mortality among children 5 to 17 years of age during the fourth wave than during the third (delta-dominant) wave (**Figure 3** and Tables S5, S6, and S7).

Discussion

In Gauteng, the resurgence of Covid-19 that was dominated by the omicron variant evolved at a time when Covid-19 vaccine coverage was 36.0% among persons 12 years of age or older, with only 20.1% having received at least two doses of a Covid-19 vaccine as part of the national vaccine rollout program. Nevertheless, the results of our survey showed widespread underlying SARS-CoV-2 seropositivity across the province (73.1%), including a prevalence at the subdistrict level of up to 85.8%, before the onset of the omicron-dominant wave. This high seroprevalence was primarily induced by previous SARS-CoV-2 infection, as evidenced by the 68.4% seroprevalence among participants who had not received a Covid-19 vaccine. The methods used for selecting the random sample of households in the survey, with a distribution proportionate to subdistrict population sizes, ensured that the sample was representative of the general population of Gauteng.

In this context, we observed a dramatic decoupling of hospitalizations and deaths from infections during the fourth wave of Covid-19, as compared with the proportions seen during the three previous waves. The biologic basis for this decoupling could be the extensive cell-mediated immunity in the population that was induced by previous natural infection and vaccination. At least one vaccine dose had been administered to 61.2% of adults older than 50 years of age (1,479,288 of 2,416,045), who had accounted for 81.0% of all deaths (22,269 of 27,500) due to Covid-19 in Gauteng through the end of the third wave.[17] Although we did not evaluate cell-mediated immunity, other studies have shown that natural infection induces a diverse polyepitopic cell-mediated immune response that targets the spike protein, nucleocapsid protein, and membrane protein.[18] Consequently, cell-mediated immunity is likely to be more durable than neutralizing antibody–mediated immunity in the context of small mutations,[19] particularly those mainly affecting the spike protein, such as those in the omicron variant. Furthermore, natural infection induces robust memory T-cell responses, including long-lived cytotoxic (CD8+) T cells, which have a half-life of 125 to 255 days.[20]

We think that the evolution of cell-mediated immunity from previous natural infection and vaccination has resulted in the decoupling of the high case incidence seen with the omicron variant from the incidence of severe disease (hospitalizations and deaths). This decoupling has occurred despite evidence that the omicron variant evades neutralizing antibody activity induced by spike-protein–based vaccines and by previous infection with other variants that did not harbor the same full set of putatively antibody-evasive mutations. Our hypothesis is supported by two recent preprint publications, which indicated that most of the T-cell response induced by vaccination or natural infection cross-recognizes the omicron variant, thereby probably contributing to protection against severe disease.[21,22] An alternative or additional mechanism by which protection against severe disease may be conferred, despite the reduced neutralizing antibody activity against the omicron variant, is through Fc-mediated effector functions of non-neutralizing antibodies that induce antibody-mediated cellular phagocytosis, complement deposition, and natural killer–cell activation.[19,23] In addition, the omicron variant may be less potent in causing serious illness.

We saw a high incidence of Covid-19 cases due to the omicron variant despite the high seroprevalence of humoral immune responses, a finding consistent with the antibody-evasive nature of the omicron variant. Reports have indicated that the omicron variant is more capable of evading neutralizing antibody activity than even the beta variant.[7,24-26] Neutralizing antibody activity against the omicron

variant after two doses of BNT162b2 or AZD1222 (also known as ChAdOx1 nCoV-19) was shown to be substantially lower than vaccine-induced neutralizing antibody activity against wild-type virus.[27,28] Nevertheless, the majority of persons with hybrid immunity from natural infection and BNT162b2 or AZD1222 vaccination have measurable neutralizing antibody activity against the omicron variant, albeit a lower level than that against the wild-type virus.[24] In this context, a high incidence of breakthrough cases and reinfections with the omicron variant was to be expected in South Africa, where the majority of persons had immunity from natural infection, which induces a lower magnitude of anti-spike neutralizing and binding antibody responses than vaccination.[25] Furthermore, as part of its vaccine rollout at the time of the evolution of the fourth wave, South Africa was providing only a single dose of Ad26.COV2.S, which induces lower titers of neutralizing and blocking antibodies than two doses of BNT162b2[25]; the third (booster) dose of BNT162b2 had not been introduced in South Africa at that time.

This clinical evidence of the antibody-evasive nature of the omicron variant is corroborated by early studies that showed limited vaccine effectiveness against omicron at 25 weeks after two doses of AZD1222 or BNT162b2.[29] However, vaccine effectiveness was substantially increased at 2 weeks after a booster dose of BNT162b2,[29] which results in much higher neutralizing antibody titers than two doses of the vaccine[30] and thus may partly mitigate the relative antibody-evasiveness of the omicron variant. In addition, in South Africa, vaccine effectiveness against hospitalization was 70% with the omicron variant, as compared with 93% with the delta variant.[31] These data, together with the very limited neutralizing antibody activity against the omicron variant after two doses of AZD1222 or BNT162b2, further corroborate the evidence that protection against severe Covid-19 due to the omicron variant is probably mediated by much lower neutralizing antibody titers than those required to protect against SARS-CoV-2 infection or mild Covid-19[25] or is provided by cell-mediated immunity or the Fc-effector functions of non-neutralizing antibodies (or a combination of these mechanisms).[19,23]

The antibody-evasive nature of the omicron variant is analogous to the antibody-evasiveness of the beta variant in recipients of AZD1222, the AstraZeneca chimpanzee adenovirus–based vaccine. AZD1222 was shown to have no effectiveness against mild-to-moderate Covid-19 due to the beta variant.[32] However, vaccine effectiveness against hospitalization or death due to the beta or P.1 (gamma) variant was 80% in a report from Canada.[33] Although AZD1222 induced nominal neutralizing antibody activity against the beta variant, only 11 of the 87 spike-protein epitopes targeted by T-cell immune responses induced by AZD1222 were affected by mutations in the beta variant.[32] The dissociation between the lack of AZD1222-induced neutralizing antibody activity and the protection against severe disease involving the lower respiratory tract was also observed in a challenge study with AZD1222 against the beta variant in a Syrian golden hamster model.[34]

Evidence of the high transmissibility of the omicron variant is corroborated by the rapid rise in reported Covid-19 cases in Gauteng during the fourth wave. Indeed, the increase in the case incidence during the fourth wave occurred faster than that during any previous wave, a finding that indicates that the omicron variant is more transmissible than even the delta variant, which had an estimated reproductive number (R_0) of 5 to 6.[35]

Our study has some limitations. First, we used publicly available data regarding Covid-19 morbidity and mortality that were collated in surveillance systems and could have changed over time, which could affect comparisons across the four waves. The DATCOV database does not distinguish between patients hospitalized for SARS-CoV-2 infection and patients hospitalized for other illnesses who incidentally had a positive test for SARS-CoV-2 on routine screening. Nevertheless, data from these systems are unlikely to have changed since the third wave. Second, changes in the frequency of testing over time limit head-to-head comparisons of case numbers across waves, although the criteria for testing have been similar since the start of the second wave. Finally, the fourth wave had not fully subsided at the time of this analysis. The numbers, incidences, and proportions of total cumulative cases, hospitalizations, and deaths attributable to this wave — in particular, the data for hospitalizations and deaths, because there is a lag in the reporting of these data — were anticipated to continue to increase somewhat. However, the subsequent increases were limited, with the incidence of excess death attributable to Covid-19 having declined to 0 per 100,000 population by January 15, 2022.

Our hypothesis that cell-mediated immunity primarily due to natural infection, with or without Covid-19 vaccination, has resulted in the decoupling of cases from severe disease remains to be investigated. In particular, the extent to which the polyepitopic T-cell response induced by vaccination against the spike protein — as well as the even more diverse polyepitopic T-cell response stimulated by natural infection, with or without vaccination — remains cross-reactive against the omicron variant warrants further investigation.[21,22] Another possible contributing factor to the decoupling of cases from severe disease with the omicron variant, as compared with the proportions seen with previous variants, is that the omicron variant may be more adept at infecting the upper airways and less adept at infecting the lower airways, which could result in reduced virulence.[36] The difference in the prevalence of immunity across waves limits our ability to draw any conclusions regarding the relative roles of reduced virulence and higher prevalence of underlying cell-mediated immunity in contributing to the decoupling of cases from severe disease observed with the omicron variant in our study.

We think that the decoupling of the incidence of Covid-19 cases from the incidences of hospitalization and death during the omicron-dominant wave in South Africa heralds a turning point in the Covid-19 pandemic, if the primary goal is protection against severe disease and death rather than prevention of infection. The 70% vaccine effectiveness against severe disease with BNT162b2 in South Africa[31] might well be due to the hybrid cell-mediated immunity induced by vaccination and natural infection. Whether the same protection against severe Covid-19 due to the omicron variant will be seen in countries in which immunity is mainly from vaccination remains to be determined.

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Data are available at www.wits-vida.org; requests for data sharing should be directed to Dr. Madhi at shabir.madhi@wits.ac.za.

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Supplementary Material

Supplementary Appendix	PDF	1557KB
Disclosure Forms	PDF	299KB

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New COVID data: South Africa has arrived at the recovery stage of the pandemic

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People wait to be vaccinated against COVID-19. Luca Sola/AFP via Getty Images

A recently published South African study set out to determine sero-positivity against SARS-CoV-2 before the fourth wave of COVID-19, in which the omicron variant was dominant. Sero-positivity measures the presence of antibodies against the virus; it indicates past infection. The study focused on Gauteng, the country's economic hub. Ozayr Patel asked Shabir Madhi to unpack the results and explain why the findings suggest that South Africa has reached a turning point in the pandemic.

What we found

The results show the levels of sero-positivity – in other words what percentage of people have antibodies to the virus – among just over 7,000 people from whom samples were taken. From these results the following rates were calculated:

- In those under 12 years of age, none of who received a COVID-19 vaccine, 56% showed presence of antibodies to SARS-CoV-2

- In those over 50 it was 80%, including 70% if unvaccinated and 93% if vaccinated
- In high density inner city areas the sero-positivity prevalence was 85%

Using the seroprevalence data, together with COVID-19 attributable deaths using excess mortality data from the South African Medical Research Council, the study was also able to impute the risk of dying following infection by SARS-CoV-2 prior to the Omicron wave in South Africa. This infection fatality risk for COVID-19 was 0.57% pre-omicron in Gauteng. This is substantially higher than 0.019% imputed for seasonal flu, which infected one-third of the population each year pre-COVID, calculated using similar methods.

Vaccination coverage: We discovered high levels of hybrid immunity: that is immunity gained from a combination of previous infections plus vaccinations.

At the time of the onset of the omicron wave, 36% of people in Gauteng had at least one dose of the vaccine. This was higher – 61% – in those over the age of 50. (This cohort was responsible for more than 80% of deaths pre-omicron.)

Based on sero-survey, 70% of vaccinated people were also infected pre-omicron. Hence they would have had substantial hybrid immunity, which has been shown to induce a broader repertoire of immune responses against the virus. Such hybrid immunity in South Africa has, however, come at the cost of loss of 300,000 lives based on South African Medical Research Council excess mortality estimates. These are three-fold higher than the official recorded number of deaths.

Based on another study, the hybrid immunity is expected to confer greater protection against infection and mild COVID-19 compared with immunity only from vaccine or natural infection.

Hospitalisations and death rates: Our study also analysed the temporal trends in COVID-19 cases, hospitalisations and deaths (recorded and COVID attributable from excess mortality) from the start of the pandemic up until the tail end of the Omicron wave. The study found a massive decoupling between the number of people becoming infected with the virus relative to COVID hospitalisation and death rates during the course of omicron compared with earlier waves. This was true across all adult age groups.

The omicron wave was associated with 10% of all hospitalisations since the start of the pandemic, whereas 44% of hospitalisations had transpired during the course of the Delta variant wave. More impressively, only 3% of COVID deaths since the start of the pandemic occurred during the omicron wave, compared with 50% during the delta dominant wave.

The findings of decoupling of infections and severe or fatal COVID-19 were similar in the 50-59 year age group. In this group the omicron wave contributed to 15% of recorded COVID hospitalisations and 2% of deaths since the start of pandemic. This compares with 46% of hospitalisations and 53% of deaths occurring in the third wave, dominated by delta. The data for people over 60 years old was similar.

The survey also found that 58% of children under 12 years of age (all unvaccinated) were sero-positive. They were not more heavily affected during the Omicron wave.

The delta dominant wave which was the most severe in South Africa, coincided with South Africa's belated COVID vaccine rollout. The high death rate during that wave is an indictment of the missed opportunities that could have prevented a large percentage of the deaths which transpired. In particular, the delayed procurement and roll out of COVID-19 vaccines in South Africa, as well as the ill-informed decision to against the WHO recommendation on the continued use of the AstraZeneca vaccine which was available to in South Africa when the Beta variant was circulating in South Africa.

In summary, the omicron wave contributed to less than 5% of all COVID-19 deaths in Gauteng. Since the start of the pandemic, the delta variant wave contributed to 50% of all of the deaths. The balance is split roughly equally between the first and second waves caused by ancestry and the beta variant.

Our findings also show that natural infection has been high and is playing a major role in how the pandemic has unfolded especially in countries with low to moderate COVID-19 rollout. These high levels of infections have, however, resulted in a massive loss of lives; which to date is likely under-estimated in low and middle income countries as shown from the South African data.

What the findings tell us

The findings indicate that South Africa is moving into the convalescent phase of the COVID pandemic – the recovery phase. This is likely to be the same in other countries with low or modest vaccine uptake, but high force of past infections. As such, South Africa needs to recaliberate its approach to the pandemic and to start managing it as we would do for other respiratory infections which too cause large number of hospitalisations and deaths.

There are still a few unknowns. Another resurgence is likely, and there might well be another variant. But it would be very surprising if further variants are able to evade the T-cell arm of the immune system which is stimulated by vaccines and natural infection. The T-cell (cell mediated immunity) arm of the immune system, appears to be the main mediator of protecting against severe COVID-19, even when there are breakthrough infections in vaccinated people or reinfections.

So why do I believe that we are at the tail end of this pandemic? It depends what metric you use. If it's about infections, we're not at the tail end. If it's about the number of deaths that will transpire from COVID-19 during 2022, relative to the number of deaths that will transpire from other preventable causes of death in countries such as South Africa, then I believe the country has pretty much arrived towards the end of this pandemic.

In South Africa about 10,000 to 11,000 people die of seasonal influenza every year. In 2019 tuberculosis killed 58 000 in 2019. But we are not declaring an emergency in South Africa to deal with flu or tuberculosis. Deaths from HIV, and complications from HIV, are about 70,000. But South Africa isn't shutting down the country to prevent deaths and infections from these diseases.

Now what?

Only 12% of people across the continent have received one dose of vaccination. The implications of our findings are that:

- Vaccine coverage must be enhanced by ensuring that adequate booster doses are given to those who require it. We might need to continue boosting. This might need to be on an annual basis for the next two to three years, especially for high risk individuals. The time line for this is until we have more experience on the durability of protection of vaccines, particularly in settings with a high prevalence of hybrid immunity (where protection may be even longer lasting.)

Campaigns should be focused primarily on high risk groups, including getting over 90% of people over 50 years of age vaccinated before the next resurgence anticipated. This should be the focus rather than the current arbitrary target of vaccinating 40%-70% of the population.

- It's still beneficial to expand vaccinations in settings with high sero-positivity. Studies on hybrid immunity show this delivers more robust and broader repertoire immune responses that could heighten protection against infection, and reduce the magnitude of future resurgences.

- It's also important that key non-pharmacuetical interventions are kept in place. This includes wearing masks in crowded poorly ventilated indoor places, and particularly high risk individuals when there is an increase in virus transmission activity.

Our findings support the optimism expressed at the beginning of 2022 in South Africa that a turning point had been reached in the pandemic. Many in high income countries dismissed this view as not applicable to their settings despite high vaccine coverage. But their experience has since generally aligned with South Africa's.

Read more: South Africa has changed tack on tackling COVID: why it makes sense

Lastly, better COVID vaccines are required. But the world is no longer at "code red". And it's time to rebuild livelihoods, economies and all other facets of life that were affected over the past two years. This is particularly true in fragile low and middle income countries.

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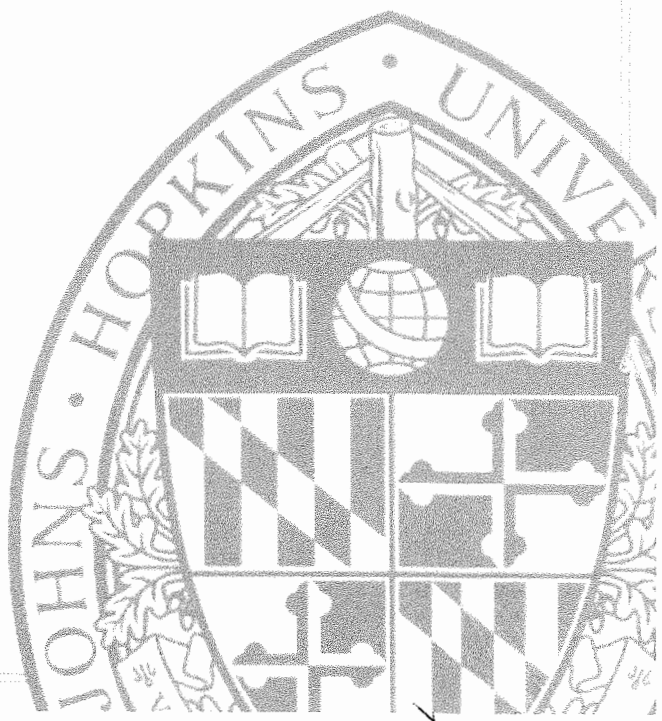

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By Jonas Herby, Lars Jonung, and Steve H. Hanke

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Abstract

This systematic review and meta-analysis are designed to determine whether there is empirical evidence to support the belief that "lockdowns" reduce COVID-19 mortality. Lockdowns are defined as the imposition of at least one compulsory, non-pharmaceutical intervention (NPI). NPIs are any government mandate that directly restrict peoples' possibilities, such as policies that limit internal movement, close schools and businesses, and ban international travel. This study employed a systematic search and screening procedure in which 18,590 studies are identified that could potentially address the belief posed. After three levels of screening, 34 studies ultimately qualified. Of those 34 eligible studies, 24 qualified for inclusion in the meta-analysis. They were separated into three groups: lockdown stringency index studies, shelter-in-place-order (SIPO) studies, and specific NPI studies. An analysis of each of these three groups support the conclusion that lockdowns have had little to no effect on COVID-19 mortality. More specifically, stringency index studies find that lockdowns in Europe and the United States only reduced COVID-19 mortality by 0.2% on average. SIPOs were also ineffective, only reducing COVID-19 mortality by 2.9% on average. Specific NPI studies also find no broad-based evidence of noticeable effects on COVID-19 mortality.

While this meta-analysis concludes that lockdowns have had little to no public health effects, they have imposed enormous economic and social costs where they have been adopted. In consequence, lockdown policies are ill-founded and should be rejected as a pandemic policy instrument.

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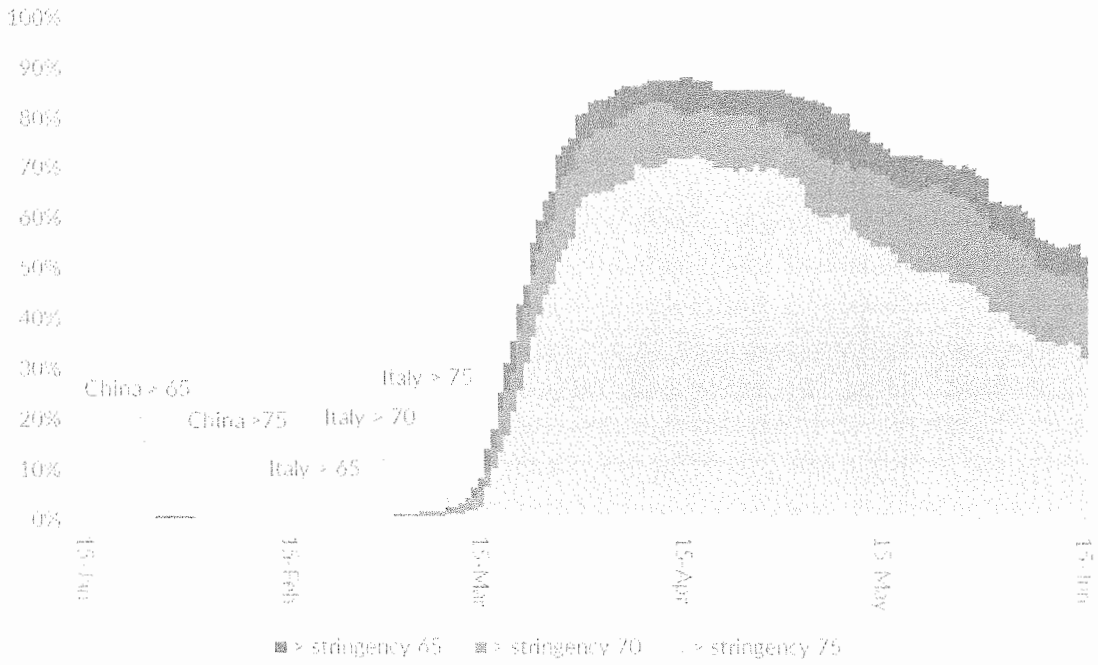
JEL Classification: I18; I38; D19

1 Introduction

The global policy reaction to the COVID-19 pandemic is evident. Compulsory non-pharmaceutical interventions (NPIs), commonly known as "lockdowns" – policies that restrict internal movement, close schools and businesses, and ban international travel – have been mandated in one form or another in almost every country.

The first NPIs were implemented in China. From there, the pandemic and NPIs spread first to Italy and later to virtually all other countries, see Figure 1. Of the 186 countries covered by the Oxford COVID-19 Government Response Tracker (OxCGRT), only Comoros, an island country in the Indian Ocean, did not impose at least one NPI before the end of March 2020.

Figure 1: Share of countries with OxCGRT stringency index above thresholds, January - June 2020



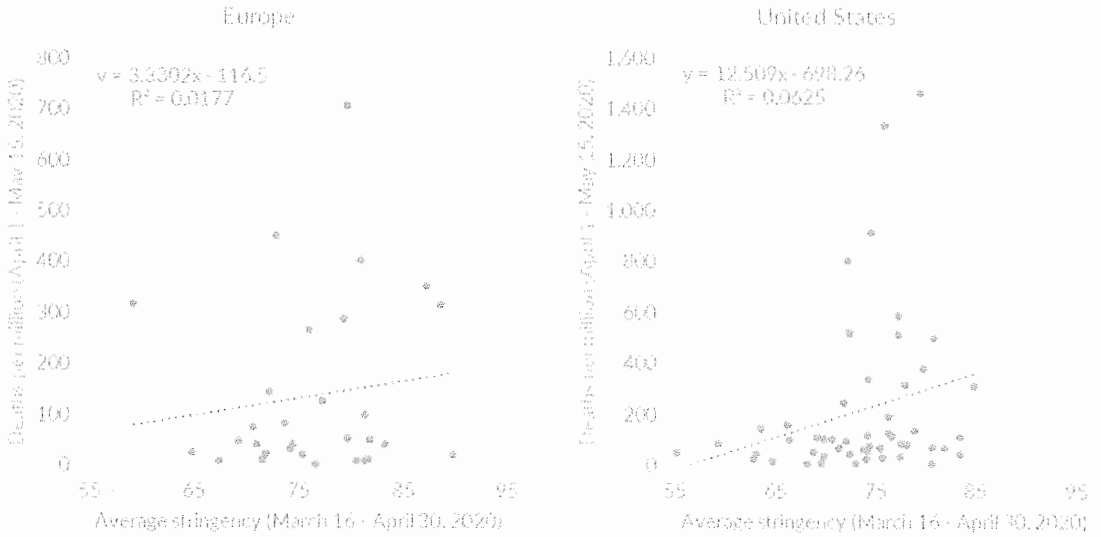
Comment: The figure shows the share of countries, where the OxCGRT stringency index on a given date surpassed index 65, 70 and 75 respectively. Only countries with more than one million citizens are included (153 countries in total). The OxCGRT stringency index records the strictness of NPI policies that restrict people's behavior. It is calculated using all ordinal containment and closure policy indicators (i.e., the degree of school and business closures, etc.), plus an indicator recording public information campaigns.
Source: Our World in Data.

Early epidemiological studies predicted large effects of NPIs. An often cited model simulation study by researchers at the Imperial College London (Ferguson et al. (2020)) predicted that a

suppression strategy based on a lockdown would reduce COVID-19 mortality by up to 98%.[1] These predictions were questioned by many scholars. Our early interest in the subject was spurred by two studies. First, Atkeson et al. (2020) showed that "across all countries and U.S. states that we study, the growth rates of daily deaths from COVID-19 fell from a wide range of initially high levels to levels close to zero within 20-30 days after each region experienced 25 cumulative deaths." Second, Sebhatu et al. (2020) showed that "government policies are strongly driven by the policies initiated in other countries," and less by the specific COVID-19-situation of the country.

A third factor that motivated our research was the fact that there was no clear negative correlation between the degree of lockdown and fatalities in the spring of 2020 (see Figure 2). Given the large effects predicted by simulation studies such as Ferguson et al. (2020), we would have expected to at least observe a simple negative correlation between COVID-19 mortality and the degree to which lockdowns were imposed.[2]

Figure 2: Correlation between stringency index and COVID-19 mortality in European countries and U.S. states during the first wave in 2020



Source: Our World in Data

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[1] With R0 = 2.4 and trigger on 60, the number of COVID-19-deaths in Great Britain could be reduced to 8,700 deaths from 510,000 deaths (-98%) with a policy consisting of case isolation + home quarantine + social distancing + school/university closure, cf. Table 4 in Ferguson et al. (2020). R0 (the basic reproduction rate) is the expected number of cases directly generated by one case in a population where all individuals are susceptible to infection.

[2] In addition, the interest in this issue was sparked by the work Jonung did on the expected economic effects of the SARS pandemic in Europe in 2006 (Jonung and Röger, 2006). In this model-based study calibrated from Spanish flu data, Jonung and Röger concluded that the economic effects of a severe pandemic would be rather limited—a sharp contrast to the huge economic effects associated with lockdowns during the COVID-19 pandemic.

Today, it remains an open question as to whether lockdowns have had a large, significant effect on COVID-19 mortality. We address this question by evaluating the current academic literature on the relationship between lockdowns and COVID-19 mortality rates.[3] We use "NPI" to describe *any government mandate which directly restrict peoples' possibilities*. Our definition does *not* include governmental recommendations, governmental information campaigns, access to mass testing, voluntary social distancing, etc., but *do* include mandated interventions such as closing schools or businesses, mandated face masks etc. We define *lockdown* as any policy consisting of at least one NPI as described above.[4]

Compared to other reviews such as Herby (2021) and Allen (2021), the main difference in this meta-analysis is that we carry out a systematic and comprehensive search strategy to identify all papers potentially relevant to answer the question we pose. We identify 34 eligible empirical studies that estimate the effect of mandatory lockdowns on COVID-19 mortality using a counterfactual difference-in-difference approach. We present our results in such a way that they can be systematically assessed, replicated, and used to derive overall meta-conclusions.[5]

2 Identification process: Search strategy and eligibility criteria

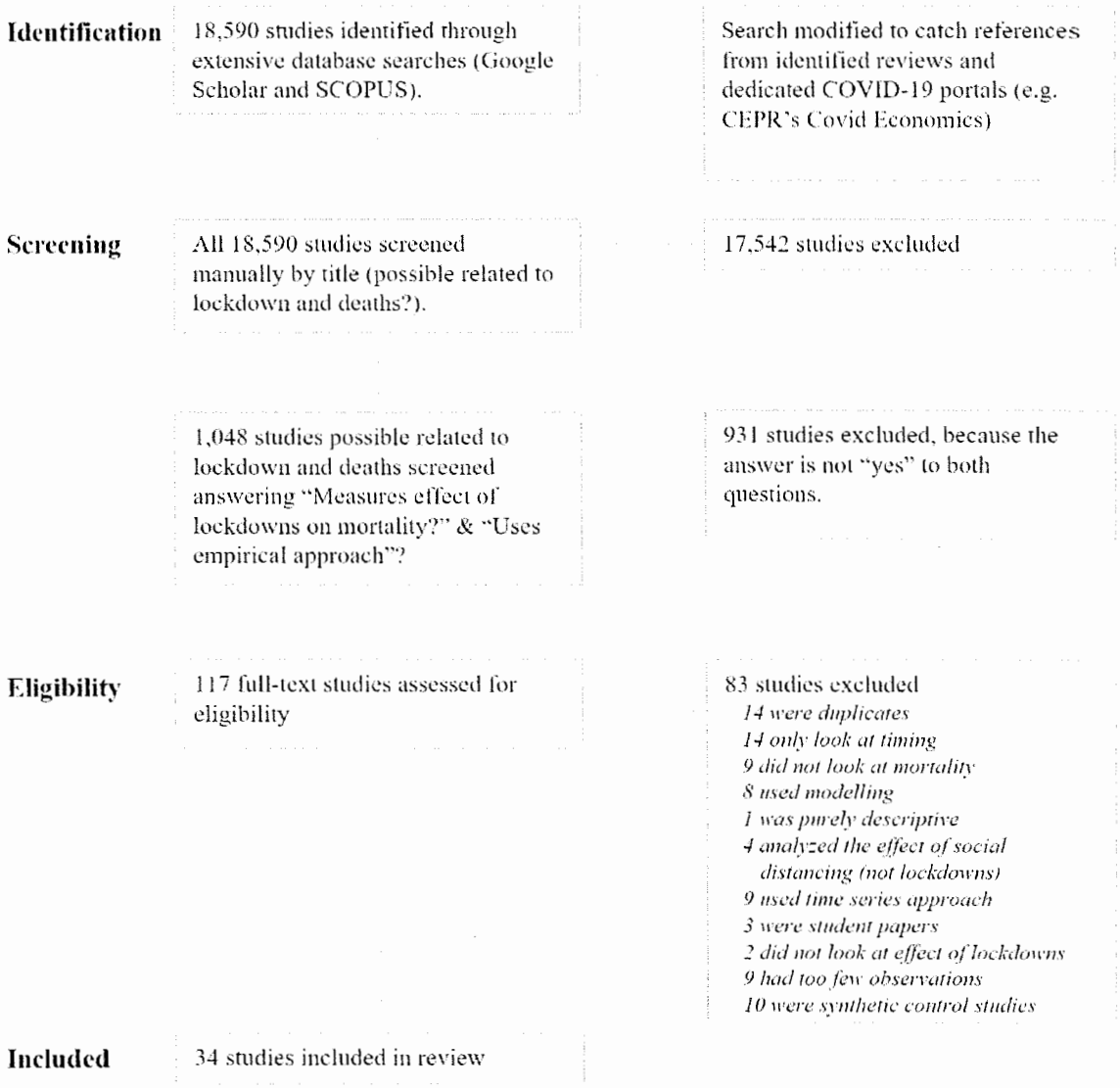
Figure 3 shows an overview of our identification process using a flow diagram designed according to PRISMA guidelines (Moher et al. (2009). Of 18,590 studies identified during our database searches, 1,048 remained after a title-based screening. Then, 931 studies were excluded, because they either did not measure the effect of lockdowns on mortality or did not use an empirical approach. This left 117 studies that were read and inspected. After a more thorough assessment, 83 of the 117 were excluded, leaving 34 studies eligible for our meta-analysis. A table with all 83 studies excluded in the final step can be found in Appendix B, Table 8.

[3] We use "mortality" and "mortality rates" interchangeably to mean COVID-19 deaths per population.

[4] For example, we will say that Country A introduced the *non-pharmaceutical interventions* school closures and shelter-in-place-orders as part of the country's *lockdown*.

[5] An interesting question is, "What damage lockdowns do to the economy, personal freedom and rights, and public health in general?" Although this question is important, it requires a full cost-benefit study, which is beyond the scope of this study.

Figure 3: PRISMA flow diagram for the selection of studies.



Below we present our search strategy and eligibility criteria, which follow the PRISMA guidelines and are specified in detail in our protocol Herby et al. (2021).

2.1 Search strategy

The studies we reviewed were identified by scanning *Google Scholar* and *SCOPUS* for English-language studies. We used a wide range of search terms which are combinations of three search strings: a disease search string ("covid," "corona," "coronavirus," "sars-cov-2"), a government

response search string[6], and a methodology search string[7]. We identified papers based on 1,360 search terms. We also required mentions of "deaths," "death," and/or "mortality." The search terms were continuously updated (by adding relevant terms) to fit this criterion.[8]

We also included all papers published in *Covid Economics*. Our search was performed between July 1 and July 5, 2021 and resulted in 18,590 unique studies.[9] All studies identified using SCOPUS and Covid Economics were also found using Google Scholar. This made us comfortable that including other sources such as VOXeu and SSRN would not change the result. Indeed, many papers found using Google Scholar were from these sources.

All 18,590 studies were first screened based on the title. Studies clearly not related to our research question were deemed irrelevant.[10]

After screening based on the title, 1,048 papers remained. These papers were manually screened by answering two questions:

1. Does the study measure the effect of lockdowns on mortality?
2. Does the study use an empirical *ex post* difference-in-difference approach (see eligibility criteria below)?

Studies to which we could not answer "yes" to both questions were excluded. When in doubt, we made the assessment based on reading the full paper, and in some cases, we consulted with colleagues.[11]

After the manual screening, 117 studies were retrieved for a full, detailed review. These studies were carefully examined, and metadata and empirical results were stored in an Excel

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[6] The government response search string used was: "non-pharmaceutical," "nonpharmaceutical," "NPI," "NPIs," "lockdown," "social distancing orders," "statewide interventions," "distancing interventions," "circuit breaker," "containment measures," "contact restrictions," "social distancing measures," "public health policies," "mobility restrictions," "covid-19 policies," "corona policies," "policy measures."

[7] The methodology search string used was: ("fixed effects," "panel data," "difference-in-difference," "diff-in-diff," "synthetic control," "counterfactual" , "counter factual," "cross country," "cross state," "cross county," "cross region," "cross regional," "cross municipality," "country level," "state level," "county level," "region level," "regional level," "municipality level," "event study."

[8] If a potentially relevant paper from one of the 13 reviews (see eligibility criteria) did not show up in our search, we added relevant words to our search strings and ran the search again. The 13 reviews were: Allen (2021); Brodeur et al. (2021); Gupta et al. (2020); Herby (2021); Johanna et al. (2020); Nussbaumer-Streit et al. (2020); Patel et al. (2020); Perra (2020); Poeschl and Larsen (2021); Pozo-Martin et al. (2020); Rezapour et al. (2021); Robinson (2021); Zhang et al. (2021).

[9] SCOPUS was continuously monitored between July 5th and publication using a search agent. Although the search agent returned several hits during this period, only one of them, An et al. (2021), was eligible according to our eligibility criteria. The study is not included in our review, but the conclusions are in line with our conclusions, as An et al. (2021) conclude that "The analysis shows that the mask mandate is consistently associated with lower infection rates in the short term, and its early adoption boosts the long-term efficacy. By contrast, the other five policy instruments— domestic lockdowns, international travel bans, mass gathering bans, and restaurant and school closures—show weaker efficacy."

[10] This included studies with titles such as "COVID-19 outbreak and air pollution in Iran: A panel VAR analysis" and "Dynamic Structural Impact of the COVID-19 Outbreak on the Stock Market and the Exchange Rate: A Cross-country Analysis Among BRICS Nations."

[11] Professor Christian Bjørnskov of University of Aarhus was particularly helpful in this process.

spreadsheet. All studies were assessed by at least two researchers. During this process, another 64 papers were excluded because they did not meet our eligibility criteria. Furthermore, nine studies with too little jurisdictional variance (< 10 observations) were excluded,[12] and 10 synthetic control studies were excluded.[13] A table with all 83 studies excluded in the final step can be found in Appendix B, Table 8. Below we explain why these studies are excluded.

2.2 Eligibility criteria

Focus on mortality and lockdowns

We only include studies that attempt to establish a relationship (or lack thereof) between lockdown policies and COVID-19 mortality or excess mortality. We exclude studies that use cases, hospitalizations, or other measures.[14]

Counterfactual difference-in-difference approach

We distinguish between two methods used to establish a relationship (or lack thereof) between mortality rates and lockdown policies. The first uses registered cross-sectional mortality data. These are *ex post* studies. The second method uses simulated data on mortality and infection rates.[15] These are *ex ante* studies.

We include all studies using a counterfactual difference-in-difference approach from the former group but disregard all *ex ante* studies, as the results from these studies are determined by model assumptions and calibrations.

Our limitation to studies using a "counterfactual difference-in-difference approach" means that we exclude all studies where the counterfactual is based on forecasting (such as a SIR-model) rather than derived from a difference-in-difference approach. This excludes studies like Duchemin et al. (2020) and Matzinger and Skinner (2020). We also exclude all studies based on interrupted time series designs that simply compare the situation before and after lockdown, as

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[12]The excluded studies with too few observations were: Alemán et al. (2020), Berardi et al. (2020), Conyon et al. (2020a), Coccia (2021), Gordon et al. (2020), Juranek and Zoutman (2021), Kapoor and Ravi (2020), Umer and Khan (2020), and Wu and Wu (2020).

[13] The excluded synthetic control studies were: Conyon and Thomsen (2021), Dave et al. (2020), Ghosh et al. (2020), Born et al. (2021), Reinbold (2021), Cho (2020), Friedson et al. (2021), Neidhöfer and Neidhöfer (2020), Cerqueti et al. (2021), and Mader and Rüttenauer (2021).

[14] Analyses based on cases may pose major problems, as testing strategies for COVID-19 infections vary enormously across countries (and even over time within a given country). In consequence, cross-country comparisons of cases are, at best, problematic. Although these problems exist with death tolls as well, they are far more limited. Also, while cases and death tolls are correlated, there may be adverse effects of lockdowns that are not captured by the number of cases. For example, an infected person who is isolated at home with family under a SIPO may infect family members with a higher viral load causing more severe illness. So even if a SIPO reduces the number of cases, it may theoretically increase the number of COVID-19-deaths. Adverse effects like this may explain why studies like Chernozhukov et al. (2021) finds that SIPO reduces the number of cases but have no significant effect on the number of COVID-19-deaths. Finally, mortality is hierarchically the most important outcome, cf. GRADEpro (2013)

[15] These simulations are often made in variants of the SIR-model, which can simulate the progress of a pandemic in a population consisting of people in different states (Susceptible, Infectious, or Recovered) with equations describing the process between these states.

the effect of lockdowns in these studies might contain time-dependent shifts, such as seasonality. This excludes studies like Bakolis et al. (2021) and Siedner et al. (2020).

Given our criteria, we exclude the much-cited paper by Flaxman et al. (2020), which claimed that lockdowns saved three million lives in Europe. Flaxman et al. assume that the pandemic would follow an epidemiological curve unless countries locked down. However, this assumption means that the only interpretation possible for the empirical results is that lockdowns are the only thing that matters, even if other factors like season, behavior etc. caused the observed change in the reproduction rate, Rt. Flaxman et al. are aware of this and state that "our parametric form of R_t assumes that changes in Rt are an immediate response to interventions rather than gradual changes in behavior." Flaxman et al. illustrate how problematic it is to force data to fit a certain model if you want to infer the effect of lockdowns on COVID-19 mortality.[16]

The counterfactual difference-in-difference studies in this review generally exploit variation across countries, U.S. states, or other geographical jurisdictions to infer the effect of lockdowns on COVID-19 fatalities. Preferably, the effect of lockdowns should be tested using randomized control trials, natural experiments, or the like. However, there are very few studies of this type.[17]

Synthetic control studies

The synthetic control method is a statistical method used to evaluate the effect of an intervention in comparative case studies. It involves the construction of a synthetic control which functions as the counter factual and is constructed as an (optimal) weighted combination of a pool of donors. For example, Born et al. (2021) create a synthetic control for Sweden which consists of 30.0% Denmark, 25.3% Finland, 25.8% Netherlands, 15.0% Norway, and 3.9% Sweden. The effect of the intervention is derived by comparing the actual developments to those contained in the synthetic control.

We exclude synthetic control studies because of their inherent empirical problems as discussed by Bjørnskov (2021b). He finds that the synthetic control version of Sweden in Born et al. (2021) deviates substantially from "actual Sweden," when looking at the period before mid-March 2020, when Sweden decided not to lock down. Bjørnskov estimates that *actual Sweden* experienced

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[16] Several scholars have criticized Flaxman et al. (2020), e.g. see Homburg and Kuhbandner (2020), Lewis (2020), and Lemoine (2020).

[17] Kepp and Bjørnskov (2021) is one such study. They use evidence from a quasi-natural experiment in the Danish region of Northern Jutland. After the discovery of mutations of Sars-CoV-2 in mink – a major Danish export – seven of the 11 municipalities of the region went into extreme lockdown in early November, while the four other municipalities retained the moderate restrictions of the remaining country. Their analysis shows that while infection levels decreased, they did so before lockdown was in effect, and infection numbers also decreased in neighbor municipalities without mandates. They conclude that efficient infection surveillance and voluntary compliance make full lockdowns unnecessary, at least in some circumstances. Kepp and Bjørnskov (2021) is not included in our review, because they focus on cases and not COVID-19 mortality. Dave et al. (2020) is another such study. They see the Wisconsin Supreme Court abolishment of Wisconsin's "Safer at Home" order (a SIPO) as a natural experiment and find that "the repeal of the state SIPO impacted social distancing, COVID-19 cases, or COVID-19-related mortality during the fortnight following enactment." Dave et al. (2020) is not included in our review, because they use a synthetic control method.

approximately 500 fewer deaths the first 11 weeks of 2020 and 4,500 fewer deaths in 2019 compared to *synthetic Sweden*.

This problem is inherent in all synthetic control studies of COVID-19, Bjørnskov argues, because the synthetic control should be fitted based on a long period of time before the intervention or the event one is studying the consequences of – i.e., the lockdown Abadie (2021). However, this is not possible for the coronavirus pandemic, as there clearly *is* no long period with coronavirus before the lockdown. Hence, the synthetic control study approach is *by design* not appropriate for studying the effect of lockdowns.

Jurisdictional variance - few observations

We exclude all interrupted time series studies which simply compare mortality rates before and after lockdowns. Simply comparing data from before and after the imposition of lockdowns could be the result of time-dependent variations, such as seasonal effects. For the same reason, we also exclude studies with little jurisdictional variance.[18] For example, we exclude Conyon et al. (2020b) who "exploit policy variation between Denmark and Norway on the one hand and Sweden on the other" and, thus, only have one jurisdictional area in the control group. Although this *is* a difference-in-difference approach, there is a non-negligible risk that differences are caused by much more than just differences in lockdowns. Another example is Wu and Wu (2020), who use all U.S. states, but pool groups of states so they end with basically three observations. None of the excluded studies cover more than 10 jurisdictional areas.[19] One study is a special case of the jurisdictional variance criteria (Auger et al. (2020). Those researchers analyze the effect of school closures in U.S. states and find that those closures reduce mortality by 35%. However, all 50 states closed schools between March 13, 2020, and March 23, 2020, which means that all difference-in-difference is based on maximum 10 days. Given the long lag between infection and death, there is a risk that Auger et al.'s approach is an interrupted time series analysis where they compare United States before and after school closures, rather than a true difference-in-difference approach. However, we choose to include this study, as it is eligible under our protocol Herby et al. (2021).

Publication status and date

We include all *ex post* studies regardless of publication status and date. That is, we cover both working papers and papers published in journals. We include the early papers because the knowledge of the COVID-19-pandemic grew rapidly in the beginning, making later papers able to stand on the shoulders of previous work. Also, in the early days of COVID-19, speed was

[18] A jurisdictional area can be countries, U.S. states, or counties. With "jurisdictional variance" we refer to variation in mandates across jurisdictional areas.

[19] All studies excluded on this criterion are listed in footnote 12.

crucial which may have affected the quality of the papers. Including them makes it possible to compare the results of early studies to studies carried out at a later stage.[20]

The role of optimal timing

We exclude papers which analyze the effect of early lockdowns in contrast to later lockdowns. There's no doubt that being prepared for a pandemic and knowing when it arrives at your doorstep is vital. However, at least two problems arise with respect to evaluating the effect of well-timed lockdowns.

First, when COVID-19 hit Europe and the United States, it was virtually impossible to determine the right timing. The World Health Organization declared the outbreak a pandemic on March 11, 2020, but at that date, Italy had already registered 13.7 COVID-19 deaths per million. On March 29, 2020, 18 days after the WHO declared the outbreak a pandemic and the earliest a lockdown response to the WHO's announcement could potentially have an effect, the mortality rate in Italy was a staggering 178 COVID-19 deaths per million with an additional 13 per million dying each day.[21]

Secondly, it is extremely difficult to differentiate between the effect of public awareness and the effect of lockdowns when looking at timing because people and politicians are likely to react to the same information. As Figure 4 illustrates, all European countries and U.S. states that were hit hard and early by COVID-19 experienced high mortality rates, whereas all countries hit relatively late experienced low mortality rates. Björk et al. (2021) illustrate the difficulties in analyzing the effect of timing. They find that a 10-stringency-points-stricter lockdown would reduce COVID-19 mortality by a total of 200 deaths per million[22] if done in week 11, 2020, but would only have approximately 1/3 of the effect if implemented one week earlier or later and no effect if implemented three weeks earlier or later. One interpretation of this result is that lockdowns do not work if people either find them unnecessary and fail to obey the mandates or if people voluntarily lock themselves down. This is the argument Allen (2021) uses for the ineffectiveness of the lockdowns he identifies. If this interpretation is true, what Björk et al. (2021) find is that information and signaling is far more important than the strictness of the lockdown. There may be other interpretations, but the point is that studies focusing on timing cannot differentiate between these interpretations. However, if lockdowns have a notable effect, we should see this effect regardless of the timing, and we should identify this effect more correctly by excluding studies that exclusively analyze timing.

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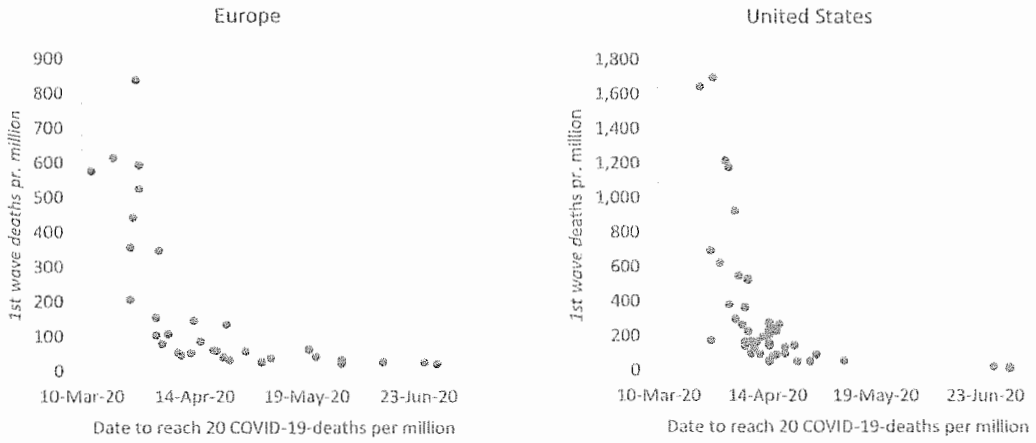
[20] We also intended to exclude studies which were primarily based on data from 2021 (as these studies would be heavily affected by vaccines) and studies that did not cover at least one EU-country, the United States, one U.S. U.S. state or Latin America, and where at least one country/state was not an island. However, we did not find any such studies.

[21] There's approximately a two-to-four-week gap between infection and deaths. See footnote 29.

[22] They estimate that 10-point higher stringency will reduce excess mortality by 20 "per week and million" in the 10 weeks from week 14 to week 23.

Figure 4: Taken by surprise. The importance of having time to prepare



Comment: The figure shows the relationship between early pandemic strength and total 1st wave of COVID-19 death toll. On the X-axis is "Days to reach 20 COVID-19-deaths per million (measured from February 15, 2020)." The Y-axis shows mortality (deaths per million) by June 30, 2020.
Source: Reported COVID-19 deaths and OxCGRT stringency for European countries and U.S. states with more than one million citizens. Data from Our World in Data.

We are aware of one meta-analysis by Stephens et al. (2020), which looks into the importance of timing. The authors find 22 studies that look at policy and timing with respect to mortality rates, however, only four were multi-country, multi-policy studies, which could possibly account for the problems described above. Stephens et al. conclude that "the timing of policy interventions across countries relative to the first Wuhan case, first national disease case, or first national death, is not found to be correlated with mortality." (See Appendix A for further discussion of the role of timing.)

3 The empirical evidence

In this section we present the empirical evidence found through our identification process. We describe the studies and their results, but also comment on the methodology and possible identification problems or biases.

3.1 Preliminary considerations

Before we turn to the eligible studies, we present some considerations that we adopted when interpreting the empirical evidence.

Empirical interpretation

While the policy conclusions contained in some studies are based on statistically significant results, many of these conclusions are ill-founded due to the tiny impact associated with said statistically significant results. For example, Ashraf (2020) states that "social distancing

measures has proved effective in controlling the spread of [a] highly contagious virus." However, their estimates show that the average lockdown in Europe and the U.S only reduced COVID-19 mortality by 2.4%.[23] Another example is Chisadza et al. (2021). The authors argue that "less stringent interventions increase the number of deaths, whereas more severe responses to the pandemic can lower fatalities." Their conclusion is based on a negative estimate for the squared term of *stringency* which results in a total negative effect on mortality rates (i.e. fewer deaths) for stringency values larger than 124. However, the stringency index is limited to values between 0 and 100 by design, so the conclusion is clearly incorrect. To avoid any such biases, we base our interpretations solely on the empirical estimates and not on the authors' own interpretation of their results.

Handling multiple models, specifications, and uncertainties

Several studies adopt a number of models to understand the effect of lockdowns. For example, Bjørnskov (2021a) estimates the effect after one, two, three, and four weeks of lockdowns. For these studies, we select the longest time horizon analyzed to obtain the estimate closest to the long-term effect of lockdowns.

Several studies also use multiple specifications including and excluding potentially relevant variables. For these studies, we choose the model which the authors regard as their main specification. Finally, some studies have multiple models which the authors regard as equally important. One interesting example is Chernozhukov et al. (2021), who estimate two models with and without national case numbers as a variable. They show that including this variable in their model alters the results substantially. The explanation could be that people responded to national conditions. For these studies, we present both estimates in Table 1, but – following Doucouliagos and Paldam (2008) – we use an average of the estimates in our meta-analysis in order to not give more weight to a study with multiple models relative to studies with just one principal model.

For studies looking at different classes of countries (e.g. rich and poor), we report both estimates in Table 1 but use the estimate for rich Western countries in our meta-analysis, where we derive common estimates for Europe and the United States.

Effects are measured "relative to Sweden in the spring of 2020"

Virtually all countries in the world implemented mandated NPIs in response to the COVID-19 pandemic. Hence, most estimates are relative to "doing the least," which in many Western countries means relative to doing as Sweden has done, especially during the first wave, when Sweden, do to constitutional constraints, implemented very few restrictions compared to other western countries (Jonung and Hanke 2020). However, some studies *do* compare the effect of doing something to the effect of doing absolutely nothing (e.g. Bonardi et al. (2020)).

The consequence is that some estimates are relative to "doing the least" while others are relative to "doing nothing." This may lead to biases if "doing the least" works as a signal (or warning)

[23] We describe how we arrive at the 2.4% in Section 4.

which alters the behavior of the public. For example, Gupta et al. (2020) find a large effect of emergency declarations, which they argue "are best viewed as an information instrument that signals to the population that the public health situation is serious and they act accordingly," on social distancing but not of other policies such as SIPOs (shelter-in-place orders). Thus, if we compare a country issuing a SIPO to a country doing nothing, we may overestimate the effect of a SIPO, because it is the sum of the signal *and* the SIPO. Instead, we should compare the country issuing the SIPO to a country "doing the least" to estimate the *marginal* effect of the SIPO.

To take an example, Bonardi et al. (2020) find relatively large effects of doing *something* but no effect of doing *more*. They find no extra effect of stricter lockdowns relative to less strict lockdowns and state that "our results point to the fact that people might adjust their behaviors quite significantly as partial measures are implemented, which might be enough to stop the spread of the virus." Hence, whether the baseline is Sweden, which implemented a ban on large gatherings early in the pandemic, or the baseline is "doing nothing" can affect the magnitude of the estimated impacts. There is no obvious right way to resolve this issue, but since estimates in most studies are relative to doing less, we report results as compared to "doing less" when available. Hence, for Bonardi et al. we state that the effect of lockdowns is zero (compared to Sweden's "doing the least").

3.2 Overview of the findings of eligible studies

Table 1 covers the 34 studies eligible for our review.[24] Out of these 34 studies, 22 were peer-reviewed and 12 were working papers. The studies analyze lockdowns during the first wave. Most of the studies (29) use data collected before September 1st, 2020 and 10 use data collected before May 1st, 2020. Only one study uses data from 2021. All studies are cross-sectional, ranging across jurisdictions. Geographically, 14 studies cover countries worldwide, four cover European countries, 13 cover the United States, two cover Europe and the United States, and one covers regions in Italy. Seven studies analyze the effect of SIPOs, 10 analyze the effect of stricter lockdowns (measured by the OxCGRT stringency index), 16 studies analyze specific NIP's independently, and one study analyzes other measures (length of lockdown).

Several studies find no statistically significant effect of lockdowns on mortality. For example, this includes Bjørnskov (2021a) and Stockenhuber (2020) who find no significant effect of stricter lockdowns (higher OxCGRT stringency index), Sears et al. (2020) and Dave et al. (2021), who find no significant effect of SIPOs, and Chaudhry et al. (2020), Aparicio and Grossbard (2021) and Guo et al. (2021) who find no significant effect of any of the analyzed NIP's, including business closures, school closures and border closures.

Other studies find a significant negative relationship between lockdowns and mortality. Fowler et al. (2021 find that SIPOs reduce COVID-19 mortality by 35%, while Chernozhukov et al.

[24] The following information can be found for each study in Table 2.

(2021) find that employee mask mandates reduces mortality by 34% and closing businesses and bars reduces mortality by 29%.

Some studies find a significant positive relationship between lockdowns and mortality. This includes Chisadza et al. (2021), who find that stricter lockdowns (higher OxCGRT stringency index) increases COVID-19 mortality by 0.01 deaths/million per stringency point and Berry et al. (2021), who find that SIPOs increase COVID-19 mortality by 1% after 14 days.

Most studies use the number of official COVID-19 deaths as the dependent variable. Only one study, Bjørnskov (2021a), looks at total excess mortality which – although is not perfect – we perceive to be the best measure, as it overcomes the measurement problems related to properly reporting COVID-19 deaths.

Several studies explicitly claim that they estimate the actual causal relationship between lockdowns and COVID-19 mortality. Some studies use instrumental variables to justify the causality associated with their analysis, while others make causality probable using anecdotal evidence.[25] But, Sebhatu et al. (2020) show that government policies are strongly driven by the policies initiated in neighboring countries rather than by the severity of the pandemic in their own countries. In short, it is not the severity of the pandemic that drives the adoption of lockdowns, but rather the propensity to copy policies initiated by neighboring countries. The Sebhatu et al. conclusion throws into doubt the notion of a causal relationship between lockdowns and COVID-19 mortality.

Table 1: Summary of eligible studies

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
Alderman and Harjoto (2020); "COVID-19: U.S. shelter-in-place orders and demographic characteristics linked to cases, mortality, and recovery rates"	COVID-19 mortality	Use State-level data from the COVID-19 Tracking Project data all U.S. states, and a multivariate regression analysis to empirically investigate the impacts of the duration of shelter-in-place orders on mortality.	Find that shelter-in-place orders are - for the average duration - associated with 1% (insignificant) fewer deaths per capita.	
Aparicio and Grossbard (2021); "Are Covid Fatalities in the U.S. Higher than in the EU, and If so, Why?"	COVID-19 mortality	Their main focus is to explain the gap in COVID-19-fatalities between Europe and the United States based on COVID-deaths and other data from 85 nations/states. They include status for "social events" (ban on public gatherings, cancellation of major events and conferences), school closures, shop closures "partial lockdowns" (e.g. night curfew) and "lockdowns" (all-day curfew) 100 days after the pandemic onset in a country/state. None of these interventions have a significant effect on COVID-19 mortality. They also find no	Find no effect of "social events" (ban on public gatherings, cancellation of major events and conferences), school closures, shop closures "partial lockdowns" (e.g. night curfew) and "lockdowns" (all-day curfew) 100 days after the pandemic onset.	In the abstract the authors states that "various types of social distance measures such as school closings and lockdowns, and how soon they were implemented, help explain the U.S./EUROPE gap in cumulative deaths measured 100 days after the pandemic's onset in a state or country" although their estimates are insignificant.

[25] E.g. Dave et al. (2021) states that "estimated case reductions accelerate over time, becoming largest after 20 days following enactment of a SIPO. These findings are consistent with a causal interpretation."

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
		significant effect of early cancelling of social events, school closures, shop closures, partial lockdowns and full lockdowns.		
Ashraf (2020); "Socioeconomic conditions, government interventions and health outcomes during COVID-19"	COVID-19 mortality	Their main focus is on the effectiveness of policies targeted to diminish the effect of socioeconomic inequalities (economic support) on COVID-19-deaths. They use data from 80 countries worldwide and include the OxCGRT stringency as a control variable in their models. The paper finds a significant negative (fewer deaths) effect of stricter lockdowns. The effect of lockdowns is insignificant, when they include an interaction term between the socioeconomic conditions index and the economic support index in their model.	For each 1-unit increase in OxCGRT stringency index, the cumulative mortality changes by -0.326 deaths per million (fewer deaths). The estimate is -0.073 deaths per million but insignificant, when including an interaction term between the socioeconomic conditions index and the economic support index.	
Auger et al. (2020); "Association between statewide school closure and COVID-19 incidence and mortality in the U.S."	COVID-19 mortality	U.S. population-based observational study which uses interrupted time series analyses incorporating a lag period to allow for potential policy-associated changes to occur. To isolate the association of school closure with outcomes, state-level nonpharmaceutical interventions and attributes were included in negative binomial regression models. Models were used to derive the estimated absolute differences between schools that closed and schools that remained open. The main outcome of the study is COVID-19 daily incidence and mortality per 100000 residents.	State that they adjust for several factors (e..g percentage of state's population aged 15 years and 65 years, CDC's social vulnerability index, stay-at-home or shelter-in-place order, restaurant and bar closure, testing rate per 1000 residents etc.), but does not specify how and do not present estimates.	All 50 states closed schools between March 13, 2020, and March 23, 2020. Hence, all difference-in-difference is based on maximum 10 days, and given the long lag between infection and death, there is a risk that their approach is more an interrupted time series analysis, where they compare United States before and after school closures, rather than a true difference-in-difference approach. However, we choose to include the study in our review as it - objectively speaking - lives up to the eligibility criteria specified in our protocol.
Berry et al. (2021); "Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic"	COVID-19 mortality	The authors use U.S. county data on COVID-19 deaths from Johns Hopkin and SIPO data from the University of Washington to estimate the effect of SIPO's. They find no detectable effects of SIPO on deaths. The authors stress that their findings should not be interpreted as evidence that social distancing behaviors are not effective. Many people had already changed their behaviors before the introduction of shelter-in-place orders, and shelter-in-place orders appear to have been ineffective precisely because they did not meaningfully alter social distancing behavior.	SIPO increases the number of deaths by 0,654 per million after 14 days (see Fig. 2)	The authors conclude that "We do not find detectable effects of these policies [SIPO] on disease spread or deaths." However, this statement does not correspond to their results. In figure 2 they show that the effect on deaths is significant after 14 days. Looks at the effect 14 days after SIPO's are implemented which is a short lag given that the time between infection and deaths is at least 2-3 weeks.
Bjørnskov (2021a); "Did Lockdown Work? An Economist's Cross-Country Comparison"	Excess mortality	Uses excess mortality and OxCGRT stringency from 24 European countries to estimate the effect of lockdown on the number of deaths one, two, three and four weeks later. Finds no effect (negative but insignificant) of (stricter) lockdowns. The author's specification using instrument variables yields similar results.	A stricter lockdown (OxCGRT stringency) does not have a significant effect on excess mortality.	Finds a positive (more deaths) effect after one and two weeks, which could indicate that other factors (omitted variables) affect the results.
Blanco et al. (2020); "Do Coronavirus Containment Measures Work? Worldwide Evidence"	COVID-19 mortality	Use data for deaths and NPIs from Hale et al. (2020) covering 158 countries between January and August 2020 to evaluate the effect of eight different NPIs (stay at home, bans on gatherings, bans on public	When using the naïve dummy variable approach, all parameters are statistically	Run the same model four times for each of the different NPIs (stay at home-orders, ban on meetings, ban on public events and mobility restrictions). These NPIs were often introduced almost simultaneously so there is a high risk of

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
		events, closing schools, lockdowns of workplaces, interruption of public transportation services, and international border closures. They address the possible endogeneity of the NPIs by using instrumental variables.	insignificant. On the contrary, estimates using the instrumental variable approach indicate that NPIs are effective in reducing the growth rate in the daily number of deaths 14 days later.	multicollinearity with each run capturing the same underlying effect. Indeed, the size and standard errors of the estimates are worryingly similar. Looks at the effect 14 days after NPIs are implemented which is a fairly short lag given the time between infection and deaths is 2-3 weeks, cf. e.g. Flaxman et al. (2020), which according to Bjørnskov (2020) appears to be the minimum typical time from infection to death).
Bonardi et al. (2020); "Fast and local: How did lockdown policies affect the spread and severity of the covid-19"	Growth rates	Use NPI data scraped from news headlines from LexisNexis and death data from Johns Hopkins University up to April 1st 2020 in a panel structure with 184 countries. Controls for country fixed effects, day fixed effects and within-country evolution of the disease.	Find that certain interventions (SIPO, regional lockdown and partial lockdown) work (in developed countries), but that stricter interventions (SIPO) do not have a larger effect than less strict interventions (e.g. restrictions on gatherings). Find no effect of border closures.	Find a positive (more deaths) effect on day 1 after lockdown which may indicate that their results are driven by other factors (omitted variables). We rely on their publicly available version submitted to CEPR Covid Economics, but estimates on the effect of deaths can be found in Supplementary material, which is available in an updated version hosted on the Danish Broadcasting Corporation's webpage: https://www.dr.dk/static/documents/2021/03/04/managing_pandemics_e3911c11.pdf
Bongaerts et al. (2021); "Closed for business: The mortality impact of business closures during the Covid-19 pandemic"	COVID-19 mortality	Uses variation in exposure to closed sectors (e.g. tourism) in municipalities within Italy to estimate the effect of business closures. Assuming that municipalities with different exposures to closed sectors are not inherently different, they find that municipalities with higher exposure to closed sectors experienced subsequently lower mortality rates.	Business shutdown saved 9,439 Italian lives by April 13th 2020. This corresponds to a reduction of deaths by 32%, as there were 20,465 COVID-19-deaths in Italy by mid April 2020.	They (implicitly) assume that municipalities with different exposures to closed sectors are not inherently different. This assumption could be problematic, as more touristed municipalities can be very different from e.g. more industrialized municipalities.
Chaudhry et al. (2020); "A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes"	COVID-19 mortality	Uses information on COVID-19 related national policies and health outcomes from the top 50 countries ranked by number of cases. Finds no significant effect of any NPI on the number of COVID-19-deaths.	Finds no significant effect on mortality of any of the analyzed interventions (partial border closure, complete border closure, partial lockdown (physical distancing measures only), complete lockdown (enhanced containment measures including suspension of all non-essential services), and curfews).	
Chernozhukov et al. (2021); "Causal impact of masks, policies, behavior on early covid-19 pandemic in the U.S."	Growth rates	Uses COVID-deaths from the New York Times and Johns Hopkins and data for U.S. States from Raifman et al. (2020) to estimate the effect of SIPO, closed nonessential businesses, closed K-12 schools, closed restaurants except takeout, closed movie theaters, and face mask mandates for employees in public facing businesses.	Finds that mandatory masks for employees and closing K-12 schools reduces deaths. SIPO and closing business (average of closed businesses, restaurants and movie theaters) has no statistically significant effect. The effect of school closures is highly sensitive to the	States that "our regression specification for case and death growths is explicitly guided by a SIR model although our causal approach does not hinge on the validity of a SIR model." We are uncertain if this means that data are managed to fit an SIR-model (and thus should fail our eligibility criteria).

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
			inclusion of national case and death data.	
Chisadza et al. (2021); "Government Effectiveness and the COVID-19 Pandemic"	COVID-19 mortality	Uses COVID-19-deaths and OxCGRT stringency from 144 countries to estimate the effect of lockdown on the number of COVID-19-deaths. Find a significant positive (more deaths) non-linear association between government response indices and the number of deaths.	An increase by 1 on "stringency index" increases the number of deaths by 0.0130 per million. The sign of the squared term is negative, but the combined non-linear estimate is positive (increases deaths) and larger than the linear estimate for all values of the OxCGRT stringency index.	The author states that "less stringent interventions increase the number of deaths, whereas more severe responses to the pandemic can lower fatalities." However, according to their estimates this is not correct, as the combined non-linear estimate cannot be negative for relevant values of the OxCGRT stringency index (0 to 100).
Dave et al. (2021); "When Do Shelter-in-Place Orders Fight Covid-19 Best? Policy Heterogeneity Across States and Adoption Time"	COVID-19 mortality	Uses smartphone location tracking and state data on COVID-19 deaths and SIPO data (supplemented by their own searches) collected by the New York Times to estimate the effect of SIPO's. Finds that SIPO was associated with a 9%–10% increase in the rate at which state residents remained in their homes full-time, but overall they do not find an significant effect on mortality after 20+ days (see Figure 4). Indicate that the lacking significance may be due to long term estimates being identified of a few early adopting states.	Finds no overall significant effect of SIPO on deaths but does find a negative effect (fewer deaths) in early adopting states.	Find large effects of SIPO on deaths after 6-14 days in early adopting states (see Table 8), which is before an SIPO-related effect would be seen. This could indicate that other factors rather than SIPO's drive the results.
Dergiades et al. (2020); "Effectiveness of government policies in response to the COVID-19 outbreak"	COVID-19 mortality	Uses daily deaths from the European Centre for Disease Prevention and Control and OxCGRT stringency from 32 countries worldwide (including U.S.) to estimates the effect of lockdown on the number of deaths.	Finds that the greater the strength of government interventions at an early stage, the more effective these are in slowing down or reversing the growth rate of deaths.	Focus is on the effect of early stage NPIs and thus does not absolutely live up to our eligibility criteria. However, we include the study as it differentiates between lockdown strength at an early stage.
Fakir and Bharati (2021); "Pandemic catch-22: The role of mobility restrictions and institutional inequalities in halting the spread of COVID-19"	COVID-19 mortality	Uses data from 127 countries. combining high-frequency measures of mobility data from Google's daily mobility reports, country-date-level information on the stringency of restrictions in response to the pandemic from Oxford's Coronavirus Government Response Tracker (OxCGRT), and daily data on deaths attributed to COVID-19 from Our World In Data and the Johns Hopkins University. Instrument stringency using day-to-day changes in the stringency of the restrictions in the rest of the world.	Find large causal effects of stricter restrictions on the weekly growth rate of recorded deaths attributed to COVID-19. Show that more stringent interventions help more in richer, more educated, more democratic, and less corrupt countries with older, healthier populations and more effective governments.	Finds a larger effect on deaths after 0 days than after 14 and 21 days (Table 3). This is surprising given that it takes 2-3 weeks from infection to death, and it may indicate that their results are driven by other factors.
Fowler et al. (2021); "Stay-at-home orders associate with subsequent decreases in COVID-19 cases and fatalities in the United States"	COVID-19 mortality	Uses U.S. county data on COVID-19 deaths and SIPO data collected by the New York Times to estimate the effect of SIPO's using a two-way fixed-effects difference-in-differences model. Find a large and early (after few days) effect of SIPO on COVID-19 related deaths.	Stay-at-home orders are also associated with a 59.8 percent (18.3 to 80.2) average reduction in weekly fatalities after three weeks. These results suggest that stay-at-home orders	Finds the largest effect of SIPO on deaths after 10 days (see Figure 4), before a SIPO-related effect could possibly be seen as it takes 2-3 weeks from infection to death. This could indicate that other factors drive their results.

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
			might have reduced confirmed cases by 390,000 (170,000 to 680,000) and fatalities by 41,000 (27,000 to 59,000) within the first three weeks in localities that implemented stay-at-home orders.	
Fuller et al. (2021); "Mitigation Policies and COVID-19–Associated Mortality — 37 European Countries, January 23–June 30, 2020"	COVID-19 mortality	Uses COVID-19-deaths and OxCGRT stringency in 37 European countries to estimate the effect of lockdown on the number of COVID-19-deaths. Find a significant negative (fewer deaths) effect of stricter lockdowns after mortality threshold is reached (the threshold is a daily rate of 0.02 new COVID-19 deaths per 100,000 population (based on a 7-day moving average))	For each 1-unit increase in OxCGRT stringency index, the cumulative mortality decreases by 0.55 deaths per 100,000.	
Gibson (2020); "Government mandated lockdowns do not reduce Covid-19 deaths: implications for evaluating the stringent New Zealand response"	COVID-19 mortality	Uses data for every county in the United States from March through June 1, 2020, to estimate the effect of SIPO (called "lockdown") on COVID-19 mortality. Policy data are acquired from American Red Cross reporting on emergency regulations. His control variables include county population and density, the elder share, the share in nursing homes, nine other demographic and economic characteristics and a set of regional fixed effects. Handles causality problems using instrument variables (IV).	Find no statistically significant effect of SIPO.	Gibson use the word "lockdown" as synonym for SIPO (writes "technically, government-ordered community quarantine")
Goldstein et al. (2021); "Lockdown Fatigue: The Diminishing Effects of Quarantines on the Spread of COVID-19 "	COVID-19 mortality	Uses panel data from 152 countries with data from the onset of the pandemic until December 31, 2020. Finds that lockdowns tend to reduce the number of COVID-19 related deaths, but also that this benign impact declines over time: after four months of strict lockdown, NPIs have a significantly weaker contribution in terms of their effect in reducing COVID-19 related fatalities.	Stricter lockdowns reduce deaths for the first 60 days, whereafter the cumulative effect begins to decrease. If reintroduced after 120, the effect of lockdowns is smaller in the short run, but after 90 days the effect is almost the same as during first lockdown (only app. 10% lower).	There is little documentation in the study (e.g. no tables with estimates).
Guo et al. (2021); "Mitigation Interventions in the United States: An Exploratory Investigation of Determinants and Impacts"	COVID-19 mortality	Uses policy data from 1,470 executive orders from the state-government websites for all 50 states and Washington DC and COVID-19-deaths from Johns Hopkins University in a random-effect spatial error panel model to estimate the effect of nine NPIs (SIPO, strengthened SIPO, public school closure, all school closure, large-gathering ban of more than 10 people, any gathering ban, restaurant/bar limit to dining out only, nonessential business closure, and mandatory self-quarantine of travelers) on COVID-19 deaths.	Two mitigation strategies (all school closure and mandatory self-quarantine of travelers) showed positive (more deaths) impact on COVID-19-deaths per 10,000. Six mitigation strategies (SIPO, public school closure, large gathering bans (>10), any gathering ban, restaurant/bar limit to dining out only, and nonessential business	Only conclude on NPIs which reduce mortality. However, the conclusion is based on one-tailed tests, which means that all positive estimates (more deaths) are deemed insignificant. Thus, in their mortality-specification (Table 3, Proportion of Cumulative Deaths Over the Population), the estimate of all school closures (.204) and mandatory self-quarantine of travelers (0.363) is deemed insignificant based on schools CI [.029, .379] and quarantine CI [.193, .532]. We believe, these results should be interpreted as a significant increase in mortality, and that these results should have been part of their conclusion.

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
			closure) did not show any impact (Table 3, "Proportion of Cumulative Deaths Over the Population).	
Hale et al. (2020); "Global assessment of the relationship between government response measures and COVID-19 deaths"	COVID-19 mortality	Uses the OxCGRT stringency and COVID-19-deaths from the European Centre for Disease Prevention and Control for 170 countries. Estimates both cross-sectional models in which countries are the unit of analysis, as well as longitudinal models on time-series panel data with country-day as the unit of analysis (including models that use both time and country fixed effects).	Finds that higher stringency in the past leads to a lower growth rate in the present, with each additional point of stringency corresponding to a 0.039%-point reduction in daily deaths growth rates six weeks later.	
Hunter et al. (2021); "Impact of non-pharmaceutical interventions against COVID-19 in Europe: A quasi-experimental non-equivalent group and time-series"	COVID-19 mortality	Uses death data from the European Centre for Disease Prevention and Control (ECDC) and NPI-data from the Institute of Health Metrics and Evaluation. Argues that they use a quasi-experimental approach to identify the effect of NPIs because no analyzed intervention was imposed by all European countries and interventions were put in place at different points in the development of the epidemics.	Finds that mass gathering restrictions and initial business closures (businesses such as entertainment venues, bars and restaurants) reduces the number of deaths, whereas closing educational facilities and issuing SIPO increases the number of deaths. Finds no effect of closing non-essential services and mandating/recommending masks (Table 3)	Finds an effect of closing educational facilities and non-essential services after 1-7 days before lockdown could possibly have an effect on the number of deaths. This may indicate that other factors are driving their results.
Langeland et al. (2021); "The Effect of State Level COVID-19 Stay-at-Home Orders on Death Rates"	COVID-19 mortality	Estimates the effect of state-level lockdowns on COVID-19 deaths using multiple quasi-Poisson regressions with lockdown time length as the explanatory variable. Does not specify how lockdown is defined and what their data sources are.	Finds no significant effect of SIPO on the number of deaths after 2-4, 4-6 and 6+ weeks.	They write that "6+ weeks of lockdown is the only setting where the odds of dying are statistically higher than in the no lockdown case." However, all estimates are insignificant in Table C. Looks as if lockdown duration may cause a causality problem, because politicians may be less likely to ease restrictions when there are many cases/deaths.
Leffler et al. (2020); "Association of country-wide coronavirus mortality with demographics, testing, lockdowns, and public wearing of masks"	COVID-19 mortality	Use COVID-19 deaths from Worldometer and info about NPIs (mask/mask recommendations, international travel restrictions and lockdowns (defined as any closure of schools or workplaces, limits on public gatherings or internal movement, or stay-at-home orders) from Hale et al. (2020) for 200 countries to estimate the effect of the duration of NPIs on the number of deaths.	Finds that masking (mask recommendations) reduces mortality. For each week that masks were recommended the increase in per-capita mortality was 8.1% (compared to 55.7% increase when masks were not recommended). Finds no significant effect of the number of weeks with internal lockdowns and international travel restrictions (Table 2).	Their "mask recommendation" category includes some countries, where masks were mandated (see Supplemental Table A1) and may (partially) capture the effect of mask mandates. Looks at duration which may cause a causality problem, because politicians may be less likely to ease restrictions when there are many cases/deaths.
Mccafferty and Ashley (2021); "Covid-19 Social Distancing Interventions by Statutory Mandate and Their Observational	Other	Use data from 27 U.S. states and 12 European countries to analyze the effect of NPIs on peak morality rate using general linear mixed effects modelling.	Finds that no mandate (school closures, prohibition on mass gatherings, business closures, stay at home	

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
Correlation to Mortality in the United States and Europe"			orders, severe travel restrictions, and closure of non-essential businesses) was effective in reducing the peak COVID-19 mortality rate.	
Pan et al. (2020); "Covid-19: Effectiveness of non-pharmaceutical interventions in the united states before phased removal of social distancing protections varies by region"	COVID-19 mortality	Uses county-level data for all U.S. states. Mortality is obtained from Johns Hopkins, while policy data are obtained from official governmental websites. Categorizes 12 policies into 4 levels of disease control; Level 1 (low) - State of Emergency; Level 2 (moderate) - school closures, restricting access (visits) to nursing homes, or closing restaurants and bars; Level 3 (high) - non-essential business closures, suspending non-violent arrests, suspending elective medical procedures, suspending evictions, or restricting mass gatherings of at least 10 people; and Level 4 (aggressive) - sheltering in place / stay-at-home, public mask requirements, or travel restrictions. Use stepped-wedge cluster randomized trial (SW-CRT) for clustering and negative binomial mixed model regression.	Concludes that only (duration of, see comment in next column) level 4 restrictions are associated with reduced risk of death, with an average 15% decline in the COVID-19 death rate per day. Implementation of level 3 and level 2 restrictions increased death rates in 6 of 6 regions, while longer duration increased death rates in 5 of 6 regions.	They focus on the negative estimate of duration of Level 4. However, their implementation estimate is large and positive, and the combined effect of implementation and duration is unclear.
Pincombe et al. (2021); "The effectiveness of national-level containment and closure policies across income levels during the COVID-19 pandemic: an analysis of 113 countries"	COVID-19 mortality	Uses daily data for 113 countries on cumulative COVID-19 death counts over 130 days between February 15, 2020, and June 23, 2020, to examine changes in mortality growth rates across the World Bank's income group classifications following shelter-in-place recommendations or orders (they use one variable covering both recommendations and orders).	Finds that shelter-in-place recommendations/orders reduces mortality growth rates in high income countries (although insignificant) but increases growth rates in countries in other income groups.	
Sears et al. (2020); "Are we #stayinghome to Flatten the Curve?"	COVID-19 mortality	Uses cellular location data from all 50 states and the District of Columbia to investigate mobility patterns during the pandemic across states and time. Adding COVID-19 death tolls and the timing of SIPO for each state they estimate the effect of stay-at-home policies on COVID-19 mortality.	Find that SIPOs lower deaths by 0.13- 0.17 per 100,000 residents, equivalent to death rates 29-35% lower than in the absence of policies. However, these estimates are insignificant at a 95% confidence interval (see Table 4). The study also finds reductions in activity levels prior to mandates. Human encounter rate fell by 63 percentage points and nonessential visits by 39 percentage points relative to pre-COVID-19 levels, prior to any state implementing a statewide mandate	In the abstract the authors state that death rates would be 42-54% lower than in the absence of policies. However, this includes averted deaths due to pre-mandate social distancing behavior (p. 6). The effect of SIPO is a reduction in deaths by 29%-35% compared to a situation without SIPO but with pre-mandate social distancing. These estimates are insignificant at a 95% confidence interval.

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
Shiva and Molana (2021); "The Luxury of Lockdown"	COVID-19 mortality	Uses COVID-19-deaths and OxCGRT stringency from 169 countries to estimate the effect of lockdown on the number of deaths 1-8 weeks later. Finds that stricter lockdowns reduce COVID-19-deaths 4 weeks later (but insignificant 8 weeks later) and have the greatest effect in high income countries. Finds no effect of workplace closures in low-income countries.	A stricter lockdown (1 stringency point) reduces deaths by 0,1% after 4 weeks. After 8 weeks the effect is insignificant.	
Spiegel and Tookes (2021); "Business restrictions and Covid-19 fatalities"	COVID-19 mortality	Use data for every county in the United States from March through December 2020 to estimate the effect of various NPIs on the COVID-19-deaths growth rate. Derives causality by 1) assuming that state regulators primarily focus on the state's most populous counties, so state regulation in smaller counties can be viewed as a quasi randomized experiment, and 2) conducting county pair analysis, where similar counties in different states (and subject to different state policies) are compared.	Finds that some interventions (e.g. mask mandates, restaurant and bar closures, gym closures, and high-risk business closures) reduces mortality growth, while other interventions (closures of low- to medium-risk businesses and personal care/spa services) did not have an effect and may even have increased the number of deaths.	In total they analyze the lockdown effect of 21 variables. 14 of 21 estimates are significant, and of these 6 are negative (reduces deaths) while 8 are positive (increases deaths). Some results are far from intuitive. E.g. mask recommendations increases deaths by 48% while mask mandates reduces deaths by 12%, and closing restaurants and bars reduces deaths by 50%, while closing bars but not restaurants only reduces deaths by 5%.
Stockenhuber (2020); "Did We Respond Quickly Enough? How Policy-Implementation Speed in Response to COVID-19 Affects the Number of Fatal Cases in Europe"	COVID-19 mortality	Uses data for the number of COVID-19 infections and deaths and policy information for 24 countries from OxCGRT to estimate the effect of stricter lockdowns on the number of deaths using principal component analysis and a generalized linear mixed model.	Finds no significant effect of stricter lockdowns on the number of fatalities (Table 4).	Groups data on lockdown strictness into four groups and lose significant information and variation.
Stokes et al. (2020); "The relative effects of non-pharmaceutical interventions on early Covid-19 mortality: natural experiment in 130 countries"	COVID-19 mortality	Uses daily Covid-19 deaths for 130 countries from the European Centre for Disease Prevention and Control (ECDC) and daily policy data from the Oxford COVID-19 Government Response Tracker (OxCGRT). Looks at all levels of restrictions for each of the nine sub-categories of the OxCGRT stringency index (school, work, events, gatherings, transport, SIPO, internal movement, travel).	Of the nine sub-categories in the OxCGRT stringency index, only travel restrictions are consistently significant (with level 2 "Quarantine arrivals from high-risk regions" having the largest effect, and the strictest level 4 "Total border closure" having the smallest effect). Restrictions on very large gatherings (>1,000) has a large significant negative (fewer deaths) effect, while the effect of stricter restrictions on gatherings are insignificant. Authors recommend that the closing of schools (level 1) has a very large (in absolute terms it's twice the effect of border quarantines) positive	Their results are counter intuitive and somewhat inconclusive. Why does limiting very large gatherings (>1,000) work, while stricter limits do not? Why do recommending school closures cause more deaths? Why is the effect of border closures before 1st death insignificant, while the effect of closing borders after 1st death is significant (and large)? And why does quarantining arrivals from high-risk regions work better than total border closures? With 23 estimated parameters in total these counter intuitive and inconclusive results could be caused by multiple test bias (we correct for this in the meta-analysis), but may also be caused by other factors such as omitted variable bias.

1. Study (Author & title)	2. Measure	3. Description	4. Results	5. Comments
			effect (more deaths) while stricter interventions on schools have no significant effect. Required cancelling of public events also has a significant positive (more deaths) effect. We focus on their 14-38 days results, as they catch the longest time frame (their 0-24 day model returns mostly insignificant results).	
Toya and Skidmore (2020); "A Cross-Country Analysis of the Determinants of Covid-19 Fatalities"	COVID-19 mortality	Uses COVID-19-deaths and lockdown info from various sources from 159 countries in a cross-country event study. Controls for country specifics by including socio-economic, political, geographic, and policy information. Finds little evidence for the efficacy of NPIs.	Complete travel restrictions prior to April 2020 reduced deaths by -0.226 per 100.000 by April 1st 2021, while mandatory national lockdown prior to April 2020 increased deaths by 0.166 by April 1st 2021. Recommended local lockdowns reduced deaths but results are based on one observation. Partial travel restrictions, mandatory local lockdowns and recommended national lockdowns did not have a significant effect on deaths.	The study looks at the lockdown status prior to April 2020 and the effect on deaths the following year (until April 1st 2021). The authors state this is to reduce concerns about endogeneity but do not explain why the lockdowns in the spring of 2020 are a good instrument for lockdowns during later waves are.
Tsai et al. (2021); "Coronavirus Disease 2019 (COVID-19) Transmission in the United States Before Versus After Relaxation of Statewide Social Distancing Measures"	Reproduction rate, Rt	Uses data for NPIs that were implemented and/or relaxed in U.S. states between 10 March and 15 July 2020. Using segmented linear regression, they estimate the extent to which relaxation of social distancing affected epidemic control, as indicated by the time-varying, state-specific effective reproduction number (Rt). Rt is based on death tolls.	Finds that in the 8 weeks prior to relaxing NPIs, Rt was declining, while after relaxation Rt started to increase.	Their Figure 1 shows that Rt on average increases app. 10 days before relaxation, which could indicate that other factors (omitted variables) affect the results.

Note: All comments on the significance of estimates are based on a 5% significance level unless otherwise stated.

It is difficult to make a conclusion based on the overview in Table 1. Is -0.073 to -0.326 deaths/million per stringency point, as estimated by Ashraf (2020), a large or a small effect relative to. the 98% reduction in mortality predicted by the study published by the Imperial College London (Ferguson et al. (2020). This is the subject for our meta-analysis in the next section. Here, it turns out that -0.073 to -0.326 deaths/million per stringency point is a relatively modest effect and only corresponds to a 2.4% reduction in COVID-19 mortality on average in the U.S. and Europe.

4 Meta-analysis: The impact of lockdowns on COVID-19 mortality

We now turn to the meta-analysis, where we focus on the impact of lockdowns on COVID-19 mortality.

In the meta-analysis, we include 24 studies in which we can derive the relative effect of lockdowns on COVID-19 mortality, where mortality is measured as COVID-19-related deaths per million. In practice, this means that the studies we included estimate the effect of lockdowns on mortality or the effect of lockdowns on mortality growth rates, while using a counterfactual estimate.[26]

Our focus is on the effect of compulsory non-pharmaceutical interventions (NPI), policies that restrict internal movement, close schools and businesses, and ban international travel, among others. We do not look at the effect of voluntary behavioral changes (e.g. voluntary mask wearing), the effect of recommendations (e.g. recommended mask wearing), or governmental services (voluntary mass testing and public information campaigns), but only on mandated NPIs.

The studies we examine are placed in three categories. Seven studies analyze the effect of stricter lockdowns based on the OxCGRT stringency indices, 13 studies analyze the effect of SIPOs (6 studies only analyze SIPOs, while seven analyze SIPOs among other interventions), and 11 studies analyze the effect of specific NPIs independently (lockdown vs. no lockdown).[27] Each of these categories is handled so that comparable estimates can be made across categories. Below, we present the results for each category and show the overall results, as well as those based on various quality dimensions.

Quality dimensions

We include quality dimensions because there are reasons to believe that can affect a study's conclusion. Below we describe the dimensions, as well as our reasons to believe that they are necessary to fully understand the empirical evidence.

- *Peer-reviewed vs. working papers*: We distinguish between peer-reviewed studies and working papers as we consider peer-reviewed studies generally being of higher quality than working papers.[28]

- *Long vs. short time period*: We distinguish between studies based on long time periods (with data series ending *after* May 31, 2020) and short time periods (data series ending at or before May 31, 2020), because the first wave did not fully end before late June in the U.S. and Europe. Thus, studies relying on short data periods lack the last part of the first wave and may yield biased results if lockdowns only "flatten the curve" and do not prevent deaths.

[26] As a minimum requirement, one needs to know the effect on the top of the curve.
[27] The total is larger than 21 because the 11 SIPO studies include seven studies which look at multiple measures.
[28] Vetted papers from CEPR Covid Economics are considered as working papers in this regard.

- *No early effect on mortality*: On average, it takes approximately three weeks from infection to death.[29] However, several studies find effects of lockdown on mortality almost immediately. Fowler et al. (2021) find a significant effect of SIPOs on mortality after just four days and the largest effect after 10 days. An early effect may indicate that other factors (omitted variables) drive the results, and, thus, we distinguish between studies which find an effect on mortality sooner than 14 days after lockdown and those that do not.[30] Note that many studies do not look at the short term and thus fall into the latter category by default.

- *Social sciences vs. other sciences*: While it is true that epidemiologists and researchers in natural sciences should, in principle, know much more about COVID-19 and how it spreads than social scientists, social scientists are, in principle, experts in evaluating the effect of various policy interventions. Thus, we distinguish between studies published by scholars in social sciences and by scholars from other fields of research. We perceive the former as being better suited for examining the effects of lockdowns on mortality. For each study, we have registered the research field for the corresponding author's associated institute (e.g., for a scholar from "Institute of economics" research field is registered as "Economics"). Where no corresponding author was available, the first author has been used. Afterwards, all research fields have been classified as either from the "Social Science" or "Other.""[31]

We also considered including a quality dimension to distinguish between studies based on excess mortality and studies based on COVID-19 mortality, as we believe that excess mortality is potentially a better measure for two reasons. First, data on total deaths in a country is far more precise than data on COVID-19 related deaths, which may be both underreported (due to lack of tests) or overreported (because some people die *with* – but not *because of* – COVID-19). Secondly, a major purpose of lockdowns is to save lives. To the extend lockdowns shift deaths *from* COVID-19 *to* other causes (e.g. suicide), estimates based on COVID-19 mortality will overestimate the effect of lockdowns. Likewise, if lockdowns save lives in other ways (e.g. fewer traffic accidents) lockdowns' effect on mortality will be underestimated. However, as only one

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[29] Leffler et al. (2020) writes, "On average, the time from infection with the coronavirus to onset of symptoms is 5.1 days, and the time from symptom onset to death is on average 17.8 days. Therefore, the time from infection to death is expected to be 23 days." Meanwhile, Stokes et al. (2020) writes that "evidence suggests a mean lag between virus transmission and symptom onset of 6 days, and a further mean lag of 18 days between onset of symptoms and death."

[30] Some of the authors are aware of this problem. E.g. Bjørnskov (2021a) writes "when the lag length extends to three or fourth weeks, that is, the length that is reasonable from the perspective of the virology of Sars-CoV-2, the estimates become very small and insignificant" and "these results confirm the overall pattern by being negative and significant when lagged one or two weeks (the period when they cannot have worked) but turning positive and insignificant when lagged four weeks."

[31] Research fields classified as social sciences were economics, public health, management, political science, government, international development, and public policy, while research fields not classified as social sciences were ophthalmology, environment, medicine, evolutionary biology and environment, human toxicology, epidemiology, and anesthesiology.

of the 34 studies (Bjørnskov (2021a)) is based on excess mortality, we are unfortunately forced to disregard this quality dimension.

Meta-data used for our quality dimensions as well as other relevant information are shown in Table 2.

Table 2: Metadata for the studies included in the meta-analysis

1. Study (Author & title)	2. Included in meta-analysis	3. Publication status	4. End of data period	5. Earliest effect	6. Field of research	7. Lockdown measure	8. Geographical coverage
Alderman and Harjoto (2020); "COVID-19: U.S. shelter-in-place orders and demographic characteristics linked to cases, mortality, and recovery rates"	Yes	Peer-review	11-Jun-20	n/a	Economics (Social science)	SIPO	United States
Aparicio and Grossbard (2021); "Are Covid Fatalities in the U.S. Higher than in the EU, and If so, Why?"	Yes	Peer-review	22-Jul-20	n/a	Economics (Social science)	Specific NPIs	Europe and United States
Ashraf (2020); "Socioeconomic conditions, government interventions and health outcomes during COVID-19"	Yes	WP	20-May-20	n/a	Economics (Social science)	Stringency	World
Auger et al. (2020); "Association between statewide school closure and COVID-19 incidence and mortality in the U.S."	Yes	Peer-review	07-May-20	>21 days	Medicine (Other)	Specific NPIs	United States
Berry et al. (2021); "Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic"	Yes	Peer-review	30-May-20	8-14 days	Public policy (Social science)	SIPO	United States
Bjørnskov (2021a); "Did Lockdown Work? An Economist's Cross-Country Comparison"	Yes	Peer-review	30-Jun-20	<8 days	Economics (Social science)	Stringency	Europe
Blanco et al. (2020); "Do Coronavirus Containment Measures Work? Worldwide Evidence"	No	WP	31-Aug-20	8-14 days	Economics (Social science)	Specific NPIs	World
Bonardi et al. (2020); "Fast and local: How did lockdown policies affect the spread and severity of the covid-19"	Yes	WP	13-Apr-20	<8 days	Economics (Social science)	Specific NPIs	World
Bongaerts et al. (2021); "Closed for business: The mortality impact of business closures during the Covid-19 pandemic"	Yes	Peer-review	13-Apr-20	8-14 days	Management (Social science)	Specific NPIs	One country
Chaudhry et al. (2020); "A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes"	Yes	Peer-review	01-Apr-20	n/a	Anesthesiology (Other)	Specific NPIs	World
Chernozhukov et al. (2021); "Causal impact of masks, policies, behavior on early covid-19 pandemic in the U.S."	Yes	Peer-review	03-Aun-20	n/a	Economics (Social science)	Specific NPIs	United States
Chisadza et al. (2021); "Government Effectiveness and the COVID-19 Pandemic"	Yes	Peer-review	01-Sep-20	n/a	Economics (Social science)	Stringency	World
Dave et al. (2021); "When Do Shelter-in-Place Orders Fight Covid-19 Best? Policy Heterogeneity Across States and Adoption Time"	Yes	Peer-review	20-Apr-20	Finds no effect	Economics (Social science)	SIPO	United States
Dergiades et al. (2020); "Effectiveness of government policies in response to the COVID-19 outbreak"	No	WP	30-Apr-20	n/a	Management (Social science)	Stringency	World
Fakir and Bharati (2021); "Pandemic catch-22: The role of mobility restrictions and institutional inequalities in halting the spread of COVID-19"	No	Peer-review	30-Jul-20	<8 days	Economics (Social science)	Stringency	World

1. Study (Author & title)	2. Included in meta-analysis	3. Publication status	4. End of data period	5. Earliest effect	6. Field of research	7. Lockdown measure	8. Geographical coverage
Fowler et al. (2021); "Stay-at-home orders associate with subsequent decreases in COVID-19 cases and fatalities in the United States"	Yes	Peer-review	07-May-20	<8 days	Public Health (Social science)	SIPO	United States
Fuller et al. (2021); "Mitigation Policies and COVID-19–Associated Mortality — 37 European Countries, January 23–June 30, 2020"	Yes	WP	30-Jun-20	n/a	Epidemiology (Other)	Stringency	Europe
Gibson (2020); "Government mandated lockdowns do not reduce Covid-19 deaths: implications for evaluating the stringent New Zealand response"	Yes	Peer-review	01-Jun-20	Finds no effect	Economics (Social science)	SIPO	United States
Goldstein et al. (2021); "Lockdown Fatigue: The Diminishing Effects of Quarantines on the Spread of COVID-19 "	Yes	WP	31-Dec-20	<8 days	International Development (Social science)	Stringency	World
Guo et al. (2021); "Mitigation Interventions in the United States: An Exploratory Investigation of Determinants and Impacts"	Yes	Peer-review	07-Apr-20	n/a	Social work (Social science)	Specific NPIs	United States
Hale et al. (2020); "Global assessment of the relationship between government response measures and COVID-19 deaths"	No	WP	27-May-20	n/a	Government (Social science)	Stringency	World
Hunter et al. (2021); "Impact of non-pharmaceutical interventions against COVID-19 in Europe: A quasi-experimental non-equivalent group and time-series"	No	Peer-review	24-Apr-20	<8 days	Medicine (Other)	Specific NPIs	Europe
Langeland et al. (2021); "The Effect of State Level COVID-19 Stay-at-Home Orders on Death Rates"	No	WP	Not specified	Finds no effect	Political Science (Social science)	Other	United States
Leffler et al. (2020); "Association of country-wide coronavirus mortality with demographics, testing, lockdowns, and public wearing of masks"	Yes	Peer-review	09-May-20	n/a	Ophthalmology (Other)	Specific NPIs	World
Mccafferty and Ashley (2021); "Covid-19 Social Distancing Interventions by Statutory Mandate and Their Observational Correlation to Mortality in the United States and Europe"	No	Peer-review	12-Apr-20	Finds no effect	Ophthalmology (Other)	Specific NPIs	Europe and United States
Pan et al. (2020); "Covid-19: Effectiveness of non-pharmaceutical interventions in the united states before phased removal of social distancing protections varies by region"	No	WP	29-May-20	n/a	Environment (Other)	Specific NPIs	United States
Pincombe et al. (2021); "The effectiveness of national-level containment and closure policies across income levels during the COVID-19 pandemic: an analysis of 113 countries"	No	Peer-review	23-Jun-20	n/a	Health Science (Social science)	SIPO	World
Sears et al. (2020); "Are we #stayinghome to Flatten the Curve?"	Yes	WP	29-Apr-20	Finds no effect	Economics (Social science)	SIPO	United States
Shiva and Molana (2021); "The Luxury of Lockdown"	Yes	Peer-review	08-Jun-20	15-21 days	Government (Social science)	Stringency	World
Spiegel and Tookes (2021); "Business restrictions and Covid-19 fatalities"	Yes	Peer-review	31-Dec-20	<8 days	Management (Social science)	Specific NPIs	United States
Stockenhuber (2020); "Did We Respond Quickly Enough? How Policy-Implementation Speed in Response to COVID-19 Affects the Number of Fatal Cases in Europe"	Yes	Peer-review	12-Jul-20	n/a	Evolutionary Biology and Environment (Other)	Stringency	Europe
Stokes et al. (2020); "The relative effects of non-pharmaceutical interventions on early	Yes	WP	01-Jun-20	n/a	Economics (Social science)	Specific NPIs	World

1. Study (Author & title)	2. Included in meta-analysis	3. Publication status	4. End of data period	5. Earliest effect	6. Field of research	7. Lockdown measure	8. Geographical coverage
Covid-19 mortality: natural experiment in 130 countries"							
Toya and Skidmore (2020); "A Cross-Country Analysis of the Determinants of Covid-19 Fatalities"	Yes	WP	01-Apr-21	n/a	Economics (Social science)	Specific NPIs	World
Tsai et al. (2021); "Coronavirus Disease 2019 (COVID-19) Transmission in the United States Before Versus After Relaxation of Statewide Social Distancing Measures"	No	Peer-review	15-Jul-20	<8 days	Psychiatry (Social science)	Specific NPIs	United States

Note: Research fields classified as social sciences were economics, public health, health science, management, political science, government, international development, and public policy, while research fields not classified as social sciences were ophthalmology, environment, medicine, evolutionary biology and environment, human toxicology, epidemiology and anesthesiology.

Interpreting and weighting estimates

The estimates used in the meta-analysis are not always readily available in the studies shown in Table 2. In Appendix B Table 9, we describe for each paper how we interpret the estimates and how they are converted to a common estimate (the relative effect of lockdowns on COVID-19 mortality) which is comparable across all studies.

Following Paldam (2015) and Stanley and Doucouliagos (2010), we also convert standard errors[32] and use the precision of each estimate (defined as 1/SE) to calculate the precision-weighted average of all estimates and present funnel plots. The precision-weighted average is our primary indicator of the efficacy of lockdowns, but we also report arithmetic averages and medians in the meta-analysis.

In the following sections, we present the meta-analysis for each of the three groups of studies (stringency index-studies, SIPO-studies, and studies analyzing specific NPIs).

4.1 Stringency index studies

Seven eligible studies examine the link between lockdown stringency and COVID-19 mortality. The results from these studies, converted to common estimates, are presented in Table 3 below. All studies are based on the COVID-19 Government Response Tracker's (OxCGRT) stringency index of Oxford University's Blavatnik School of Government (Hale et al. (2020)).

The OxCGRT stringency index neither measures the expected effectiveness of the lockdowns nor the expected costs. Instead, it describes the stringency based on nine equally weighted parameters.[33] Many countries followed similar patterns and almost all countries closed schools,

[32] Standard errors are converted such that the t-value, calculated based on common estimates and standard errors, is unchanged. When confidence intervals are reported rather than standard errors, we calculate standard errors using t-distribution with ∞ degrees of freedom (i.e. 1.96 for 95% confidence interval).

[33] The nine parameters are "C1 School closing," "C2 Workplace closing," "C3 Cancel public events," "C4 Restrictions on gatherings," "C5 Close public transport," "C6 Stay at home requirements," "C7 Restrictions on internal movement," "C8 International travel controls" and "H1 Public information campaigns." The latter, "H1

while only a few countries issued SIPOs without closing businesses. Hence, it is reasonable to perceive the stringency index as continuous, although not necessarily linear. The index includes recommendations (e.g. "workplace closing" is 1 if the government recommends closing (or work from home), cf. Hale et al. (2021)), but the effect of including recommendations in the index is primarily to shift the index parallelly upward and should not alter the results relative to our focus on mandated NPIs. It is important to note that the index is not perfect. As pointed out by Book (2020), it is certainly possibly to identify errors and omissions in the index. However, the index is objective and unbiased and as such, useful for cross-sectional analysis with several observations, even if not suitable for comparing the overall strictness of lockdowns in two countries.

Since the studies examined use different units of estimates, we have created common estimates for Europe and United States to make them comparable. The common estimates show the effect of the average lockdown in Europe and United States (with average stringencies of 76 and 74, respectively, between March 16th and April 15th, 2020, compared to a policy based solely on recommendations (stringency 44)). For example, Ashraf (2020) estimates that the effect of stricter lockdowns is -0.073 to -0.326 deaths/million per stringency point. We use the average of these two estimates (-0.200) in the meta-analysis (see Table 9 in Appendix B for a description for all studies). The average lockdown in Europe between March 16th and April 15th, 2020, was 32 points stricter than a policy solely based on recommendations (76 vs. 44). In United States, it was 30 points. Hence, the total effect of the lockdowns compared to the recommendation policy was -6.37 deaths/million in Europe (32 x -0.200) and -5.91 deaths/million in United States. With populations of 748 million and 333 million, respectively the total effect as estimated by Ashraf (2020) is 4,766 averted COVID-19 deaths in Europe and 1,969 averted COVID-19 deaths in United States. By the end of the study period in Ashraf (2020), which is May 20, 2020, 164,600 people in Europe and 97,081 people in the United States had died of COVID-19. Hence, the 4,766 averted COVID-19 deaths in Europe and the 1,969 averted COVID-19 deaths in the United States corresponds to 2.8% and 2.0% of all COVID-19 deaths, respectively, with an arithmetic average of 2.4%. Our common estimate is thus -2.4%, cf. Table 3. So, this means that Ashraf (2020) estimates that without lockdowns, COVID-19 deaths in Europe would have been 169,366 and COVID-19 deaths in the U.S. would have been 99,050. Our approach is not unproblematic. First of all, the level of stringency varies over time for all countries. We use the stringency between March 16th and April 15th, 2020 because this period covers the main part of the first wave which most of the studies analyze. Secondly, OxCGRT has changed the index over time and a 10-point difference today may not be exactly the same as a 10-point difference when the studies were finalized. However, we believe these problems are unlikely to significantly alter our results.

Public information campaigns," is not an intervention following our definition, as it is not a mandatory requirement. However, of 97 European countries and U.S. States in the OxCGRT database, only Andorra, Belarus, Bosnia and Herzegovina, Faeroe Islands, and Moldova – less than 1.6% of the population – did not get the maximum score by March 20, 2020, so the parameter simply shifts the index parallelly upward and should not have notable impact on the analyzes.

Table 3 demonstrates that the studies find that lockdowns, on average, have reduced COVID-19 mortality rates by 0.2% (precision-weighted). The results yield a median of -2.4% and an arithmetic average of -7.3%. Only one of the seven studies, Fuller et al. (2021), finds a significant *and* (relative to the effect predicted in studies like Ferguson et al. (2020)) substantial effect of lockdowns (-35%). The other six studies find much smaller effects. Hence, based on the stringency index studies, we find little to no evidence that mandated lockdowns in Europe and the United States had a noticeable effect on COVID-19 mortality rates. And, as will be discussed in the next paragraph, the fifth column of Table 3 displays the number of quality dimensions (out of 4) met by each study.

Table 3: Overview of common estimates from studies based on stringency indexes

Effect on COVID-19 mortality	Estimate (Estimated Averted Deaths / Total Deaths)	Standard error	Weight (1/SE)	Quality dimensions
Bjørnskov (2021)	-0.3%	0.8%	119	3
Shiva and Molana (2021)	-4.1%	0.4%	248	4
Stockenhuber (2020)*	0.0%	n/a	n/a	3
Chisadza et al. (2021)	0.1%	0.0%	7,390	4
Goldstein et al. (2021)	-9.0%	3.8%	26	2
Fuller et al. (2021)	-35.3%	9.1%	11	2
Ashraf (2020)	-2.4%	0.4%	256	2
Precision-weighted average (arithmetic average / median)	-0.2% (-7.3%/-2.4%)			

Note: The table shows the estimates for each study converted to a common estimate, i.e. the implied effect on COVID-19 mortality in Europe and United States. A negative number corresponds to fewer deaths, so -5% means 5% lover COVID-19 mortality. For studies which report estimates in deaths per million, the common estimate is calculated as: (COVID-19 mortality with "common area's" policy) / (COVID-19 mortality with recommendation policy) -1, where (COVID-19 mortality with recommendation policy) is calculated as ((COVID-19 mortality with "common area's" policy) - Estimate x Difference in stringency x population). Stringencies in Europe and United States are equal to the average stringency from March 16th to April 15th 2020 (76 and 74 respectively) and the stringency for the policy based solely on recommendations is 44 following Hale et al. (2020). For the conversion of other studies see Table 9 in appendix B.

** It is not possible to calculate a common estimate for Stockenhuber (2020). When calculating arithmetic average / median, the study is included as 0%, because estimates are insignificant and signs of estimates are mixed (higher strictness can cause both lower and higher COVID-19 mortality).*

We now turn to the quality dimensions. Table 4 presents the results differentiated by the four quality dimensions. Two studies, Shiva and Molana (2021) and Chisadza et al. (2021), meet all quality dimensions. The precision-weighted average for these studies is 0.0%, meaning that lockdowns had no effect on COVID-19 mortality. Two studies live up to 3 of 4 quality dimensions (Bjørnskov (2021a) and Stockenhuber (2020)). The precision-weighted average for these studies is -0.3%, meaning that lockdowns reduced COVID-19 mortality by 0.3%. Three studies lack at least two quality dimensions.[34] These studies find that lockdowns reduce COVID-19 mortality by 4.2%. To sum up, we find that the studies that meet at least 3 of 4 quality measures find that lockdowns have little to no effect on COVID-19 mortality, while studies that

[34] In fact, the working papers by P. Goldstein et al. (2021), Fuller et al. (2021) and Ashraf (2020) all lack exactly two quality parameters.

meet 2 of 4 quality measures find a small effect on COVID-19 mortality. These results are far from those estimated with the use of epidemiological models, such as the Imperial College London (Ferguson et al. (2020).

Table 4: Overview of common estimates split on quality dimensions for studies based on stringency indexes

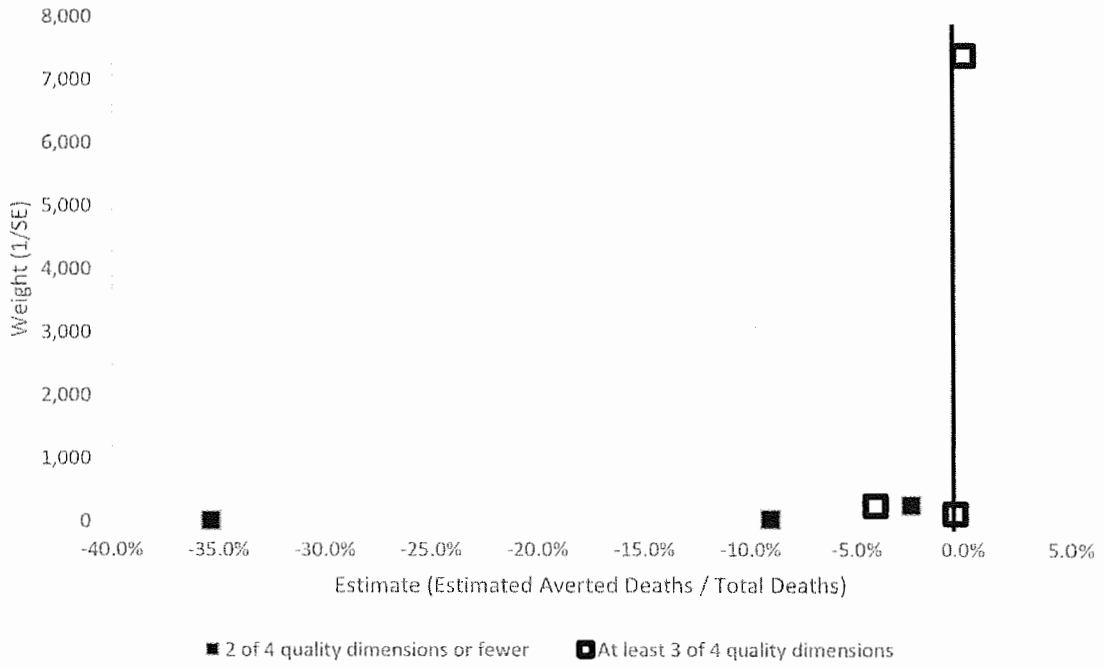
Values show effect on COVID-19 mortality	Precision-weighted average*	Arithmetic average	Median
Peer-reviewed vs. working papers			
Peer-reviewed [4]	0.0%	-1.1%	-0.2%
Working paper [3]	-4.2%	-15.6%	-9.0%
Long vs. short time period			
Data series ends after 31 May 2020 [6]	-0.1%	-8.1%	-0.2%
Data series ends before 31 May 2020 [1]	-2.4%	-2.4%	-9.0%
No early effect on mortality			
Does not find an effect within the first 14 days (including n/a) [5]	-0.2%	-8.3%	-2.4%
Finds effect within the first 14 days [2]	-1.9%	-4.7%	-4.7%
Social sciences vs. other sciences			
Social sciences [5]	-0.1%	-3.1%	-2.4%
Other sciences [2]	-35.3%	-17.7%	-17.7%
4 of 4 quality dimensions [2]	**0.0%**	**-2.0%**	**-2.0%**
3 of 4 quality dimensions [2]	**-0.3%**	**-0.2%**	**-0.2%**
2 of 4 quality dimensions or fewer [3]	**-4.2%**	**-15.6%**	**-9.0%**

*Note: The table shows the common estimate as described in Table 3 for each quality dimension. The number of studies in each category is in square brackets. * The precision-weighted average does not include studies where no common standard error is available, cf. Table 3.*

Figure 5 shows a funnel plot for the studies in Table 3, except Stockenhuber (2020), where common estimate standard errors cannot be derived. Chisadza et al. (2021) has a far higher precision than the other studies (1/SE is 7,398 and the estimate is 0.1%)[35], and there are indications that the estimate from Fuller et al. (2021) (the bottom left) is an imprecise outlier.[36] Figure 5 The plot also shows that the studies with at least 3 of 4 quality dimensions are centered around zero and generally have higher precision than other studies.

[35] Excluding Chisadza et al. (2021) from the precision-weighted average changes the average to -3.5%.
[36] Excluding Fuller et al. (2021) from the precision-weighted average only marginally changes the average because the precision is very low.

Figure 5: Funnel plot for estimates from studies based on stringency indexes



Note: The figure displays all estimates and the precision of the estimate defined as one over the standard error. Studies where standard errors are not available are not included. Studies which live up to at least 3 of 4 quality dimensions are marked with white, while studies which lives up to 2 of 3 quality dimensions or less are marked with black. The vertical line illustrates the precision-weighted average.

Overall conclusion on stringency index studies

Compared to a policy based solely on recommendations, we find little evidence that lockdowns had a noticeable impact on COVID-19 mortality Only one study, Fuller et al. (2021), finds a substantial effect, while the rest of the studies find little to no effect. Indeed, according to stringency index studies, lockdowns in Europe and the United States reduced only COVID-19 mortality by 0.2% on average.

In the following section we will look at the effect of SIPOs. The section follows the same structure as this section.

4.2 Shelter-in-place order (SIPO) studies

We have identified 13 eligible studies which estimate the effect of Shelter-In-Place Orders (SIPOs) on COVID-19 mortality, cf. Table 5. Seven of these studies look at multiple NPIs of which a SIPO is just one, while six studies estimate the effect of a SIPO vs. no SIPO in the United States. According to the containment and closure policy indicators from OxCGRT, 41 states in the U.S. issued SIPOs in the spring of 2020. But usually, these were introduced after implementing other NPIs such as school closures or workplace closures. On average, SIPOs

were issued 7½ days after *both* schools and workplaces closed, and 12 days after the first of the two closed. Only one state, Tennessee, issued a SIPO before schools and workplaces closed. The 10 states that did not issue SIPOs all closed schools. Moreover, of those 10 states, three closed some non-essential businesses, while the remaining 7 closed all non-essential businesses. Because of this, we perceive estimates for SIPOs based on U.S.-data as the marginal effect of SIPOs on top of other restrictions, although we acknowledge that the estimates may capture the effects of other NPI measures as well.

The results of eligible studies based on SIPOs are presented in Table 5. The table demonstrates that the studies generally find that SIPOs have reduced COVID-19 mortality by 2.9% (on a precision-weighted average). There is an apparent difference between studies in which a SIPO is one of multiple NPIs, and studies in which a SIPO is the only examined intervention. The former group generally finds that SIPOs *increase* COVID-19 mortality *marginally*, whereas the latter finds that SIPOs *decrease* COVID-19 mortality. As we will see below, this difference could be explained by differences in the quality dimensions, and especially the time period covered by each study.

Table 5: Overview of estimates from studies based on SIPOs

Values show effect on COVID-19 mortality	Estimate (Estimated Averted Deaths / Total Deaths)	Standard error	Weight (1/SE)	Quality dimensions
Studies where SIPO is one of several examined interventions and not (as) likely to capture the effect of other interventions				
Chernozhukov et al. (2021)	-17.7%	14.3%	7	4
Chaudhry et al. (2020) *	0.0%	n/a	n/a	2
Aparicio and Grossbard (2021)	2.6%	2.8%	35	4
Stokes et al. (2020)	0.8%	11.1%	9	3
Spiegel and Tookes (2021)	13.1%	6.6%	15	3
Bonardi et al. (2020)	0.0%	n/a	n/a	1
Guo et al. (2021)	4.6%	14.8%	4	3
Average (median) where SIPO is one of several variables	2.8% (0.5%/0.8%)			
Studies where SIPO is the only examined intervention and may capture the effect of other interventions				
Sears et al. (2020)	-32.2%	17.6%	6	2
Alderman and Harjoto (2020)	-1.0%	0.6%	169	4
Berry et al. (2020)	1.1%	n/a	n/a	2
Fowler et al. (2021)	-35.0%	7.0%	14	2
Gibson (2020)	-6.0%	24.3%	4	4
Dave et al. (2020)	-40.8%	36.1%	3	3
Average (median) where SIPO is the only variable	-5.1% (-19.0%/-19.1%)			
Precision-weighted average (arithmetic average / median) for all studies	-2.9% (-8.5%/0.0%)			

*Note: * Chaudhry et al. (2020) does not provide an estimate but states that SIPO is insignificant. We use 0% when calculating the arithmetic average and median. Chaudhry et al. (2020) and Berry et al. (2021) do not affect the precision-weighted average, as we do not know the standard errors.*

Table 6 presents the results differentiated by quality dimensions. Four studies (Chernozhukov et al. (2021), Aparicio and Grossbard (2021), Alderman and Harjoto (2020) and Gibson (2020))

meet all quality dimensions but find vastly different effects of SIPOs on COVID-19 mortality. The precision weighted average of the four studies is -1.0%. Four studies meet 3 of 4 quality dimensions. They overall find that SIPOs *increase* COVID-19 mortality, as the precision-weighted average is positive (3.7%). The five studies that meet 2 of 4 quality dimensions or fewer[37] find a substantial reduction in COVID-19-mortality (-34.2%). This substantial reduction seems to be driven by relatively short data series. The latest data point for the three studies which find large effects of lockdowns (Sears et al. (2020), Fowler et al. (2021), and Dave et al. (2021)) are April 29, May 7, and April 20, respectively. This may indicate that SIPOs can delay deaths but not eliminate them completely. Disregarding these studies with short data series, the precision-weighted average is -0.1%.

Table 6: Quality dimensions for studies based on SIPOs

Values show effect on COVID-19 mortality	Precision-weighted average*	Arithmetic average	Median
Peer-reviewed vs. working papers			
Peer-review [10]	-2.4%	-7.9%	-0.5%
Working paper [3]	-12.0%	-10.5%	0.0%
Long vs. short time period			
Data serie ends after 31 May 2020 [6]	-0.1%	-1.4%	-0.1%
Data serie ends before 31 May 2020 [7]	-25.9%	-14.6%	0.0%
No early effect on mortality			
Finds effect within the first 14 days [9]	-2.0%	-10.0%	-1.0%
Does not find an effect within the first 14 days (including n/a) [4]	-10.3%	-5.2%	0.0%
Social sciences vs. other sciences			
Social sciences [12]	-2.9%	-9.2%	-0.5%
Other sciences [1]	n/a	0.0%	0.0%
4 of 4 quality dimensions [4]	-1.0%	-5.5%	-3.5%
3 of 4 quality dimensions [4]	3.7%	-5.6%	2.7%
2 of 4 quality dimensions or fewer [5]	-34.2%	-13.2%	0.0%

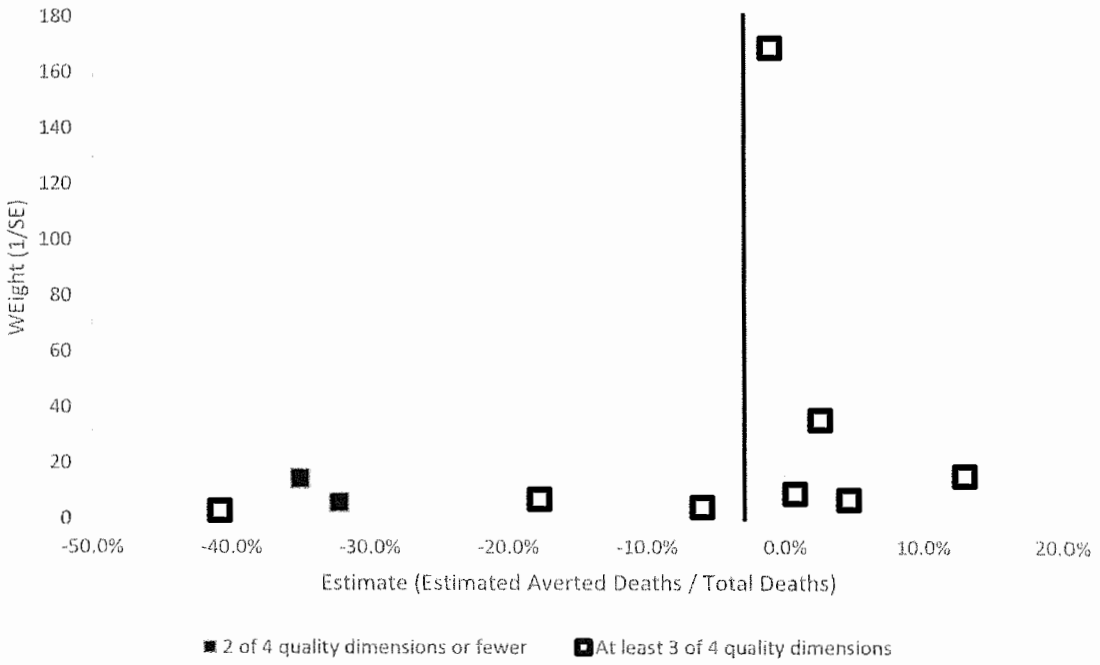
*Note: The table shows the common estimate as described in Table 5 for each quality dimension. The number of studies in each category is in square brackets. * The precision-weighted average does not include studies where no common standard error is available, cf. Table 5.*

Figure 6 shows a funnel plot for the studies in Table 5, except Chaudhry et al. (2020) and Berry et al. (2021), where common standard errors cannot be derived. Sears et al. (2020) stands out with a precision far higher than those of the other studies. But generally, the precisions of the studies are low and the estimates are placed on both sides of the zero-line with some 'tail' to the

[37] Bonardi et al. (2020) only meet one quality dimension (social science).

left.[38] Figure 5 also shows that four of eight studies with at least 3 of 4 quality dimensions find that SIPOs *increase* COVID-19 mortality by 0.8% to 13.1%.

Figure 6: Funnel plot for estimates from SIPO studies



Note: The figure displays all estimates and the precision of the estimate defined as one over the standard error. Studies where standard errors are not available are not included. Studies which live up to at least 3 of 4 quality dimensions are marked with white, while studies which lives up to 2 of 4 quality dimensions or less are marked with black. The vertical line illustrates the precision-weighted average.

Overall conclusion on SIPO studies

We find no clear evidence that SIPOs had a noticeable impact on COVID-19 mortality. Some studies find a large negative relationship between lockdowns and COVID-19 mortality, but this seems to be caused by short data series which does not cover a full COVID-19 'wave'. Several studies find a small positive relationship between lockdowns and COVID-19 mortality. Although this appears to be counterintuitive, it could be the result of an (asymptomatic) infected person being isolated at home under a SIPO can infect family members with a higher viral load causing more severe illness.[39] The overall effect measured by the precision-weighted average is -2.9%. The result is in line with Nuzzo et al. (2019), who state that "In the context of a high-impact

[38] This could indicate some publication bias, but the evidence is weak and with only 13 estimates, this cannot be formally tested

[39] E.g. see Guallar et al. (2020), who concludes, "Our data support that a greater viral inoculum at the time of SARS-CoV-2 exposure might determine a higher risk of severe COVID-19."

respiratory pathogen, quarantine may be the least likely NPI to be effective in controlling the spread due to high transmissibility" and World Health Organization Writing Group (2006), who conclude that "forced isolation and quarantine are ineffective and impractical."[40]

In the following section, we will look at the effect found in studies analyzing specific NPIs.

4.3 Studies of specific NPIs

A total of 11 eligible studies look at (multiple) specific NPIs independently or simply lockdown vs. no lockdown.[41] The definition of the specific NPIs varies from study to study and are somewhat difficult to compare. The variety in the definitions can be seen in the analysis of non-essential business closures and bar/restaurant closures. Chernozhukov et al. (2021) focus on a combined parameter (the average of business closure and bar/restaurant closure in each state), Aparicio and Grossbard (2021) look at business closure but not bar/restaurant closure, Spiegel and Tookes (2021) examine bar/restaurant closure but not business closure, and Guo et al. (2021) look at both business closures and bar/restaurant closures independently.

Some studies include several NPIs (e.g. Stokes et al. (2020) and Spiegel and Tookes (2021)), while others cover very few. Bongaerts et al. (2021) only study business closures, and Leffler et al. (2020) look at internal lockdown and international travel restrictions). Few NPIs in a model are potentially a problem because they can capture the effect of excluded NPIs. On the other hand, several NPIs in a model increase the risk of multiple test bias.

The differences in the choice of NPIs and in the number of NPIs make it challenging to create an overview of the results. In Table 7, we have merged the results in six overall categories but note that the estimates may not be fully comparable across studies. In particular, the lockdown-measure varies from study to study and in some cases is poorly defined by the authors. Also, there are only a few estimates within some of the categories. For instance, the estimate of the effect of facemasks is based on only two studies.

Table 7 illustrates that generally there is no evidence of a noticeable relationship between the most-used NPIs and COVID-19. Overall, lockdowns and limiting gatherings seem to increase COVID-19 mortality, although the effect is modest (0.6% and 1.6%, respectively) and border closures has little to no effect on COVID-19 mortality, with a precision-weighted average of -0.1% (removing the imprecise outlier from Guo et al. (2021) changes the precision-weighted average to -0.2%). We find a small effect of school closure (-4.4%), but this estimate is mainly driven by Auger et al. (2020), who – as noted earlier – use an "interrupted time series study"

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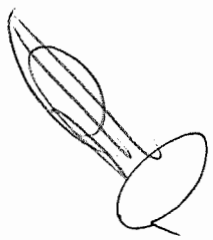
[40] Both Nuzzo et al. (2019) and World Health Organization Writing Group (2006) focus on quarantining infected persons. However, if quarantining infected persons is not effective, it should be no surprise that quarantining uninfected persons could be ineffective too.

[41] Note that we – according to our search strategy – did not search on specific measures such as "school closures" but on words describing the overall political approach to the COVID-19 pandemic such as "non-pharmaceutical," "NPIs," "lockdown" etc.



approach and may capture other effects such as seasonal and behavioral effects. The absence of a notable effect of school closures is in line with Irfan et al. (2021), who – based on a systematic review and meta-analysis of 90 published or preprint studies of transmission in children – concluded that "risks of infection among children in educational-settings was lower than in communities. Evidence from school-based studies demonstrate it is largely safe for young children (<10 years of age) to be at schools; however, older children (between 10 and 19 years of age) might facilitate transmission." UNICEF (2021) and ECDC (2020) reach similar conclusions.[42]

Mandating facemasks – an intervention that was not widely used in the spring of 2020, and in many countries was even discouraged – seems to have a large effect (-21.2%), but this conclusion is based on only two studies.[43] Again, our categorization may play a role, as the larger mask-estimate from Chernozhukov et al. (2021) is in fact "employee facemasks," not a general mask mandate. Our findings are somewhat in contrast to the result found in a review by Liu et al. (2021), who conclude that "fourteen of sixteen identified randomized controlled trials comparing face masks to no mask controls failed to find statistically significant benefit in the intent-to-treat populations." Similarly, a pre-COVID Cochrane review concludes, "There is low certainty evidence from nine trials (3507 participants) that wearing a mask may make little or no difference to the outcome of influenza-like illness (ILI) compared to not wearing a mask (risk ratio (RR) 0.99, 95% confidence interval (CI) 0.82 to 1.18). There is moderate certainty evidence that wearing a mask probably makes little or no difference to the outcome of laboratory-confirmed influenza compared to not wearing a mask (RR 0.91, 95% CI 0.66 to 1.26; 6 trials; 3005 participants)" (Jefferson et al. (2020)).[44] However, it should be noted that even if no effect is found in controlled settings, this does not necessarily imply that mandated face masks does not reduce mortality, as other factors may play a role (e.g. wearing a mask may function as a tax on socializing if people are bothered by wearing a face masks when they are socializing).

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[42] UNICEF (2021) concludes, "The preliminary findings thus far suggest that in-person schooling – especially when coupled with preventive and control measures – had lower secondary COVID-19 transmission rates compared to other settings and do not seem to have significantly contributed to the overall community transmission risks." Whereas, ECDC (2020) conclude, "School closures can contribute to a reduction in SARS-CoV-2 transmission, but by themselves are insufficient to prevent community transmission of COVID-19 in the absence of other nonpharmaceutical interventions (NPIs) such as restrictions on mass gathering," and states, "There is a general consensus that the decision to close schools to control the COVID-19 pandemic should be used as a last resort. The negative physical, mental health and educational impact of proactive school closures on children, as well as the economic impact on society more broadly, would likely outweigh the benefits."

[43] Note again, that we – according to our search strategy – did not search on the specific measures such as "masks," "face masks," "surgical masks" but on words describing the overall political approach to the COVID-19 pandemic such as "non-pharmaceutical," "NPIs," "lockdown" etc. Thus, we do not include most of the studies in mask reviews such as Liu et al. (2021) and Jefferson et al. (2020).

[44] Lipp and Edwards (2014) also find no evidence of an effect and – looking at disposable surgical face masks for preventing surgical wound infection in clean surgery – conclude, "Three trials were included, involving a total of 2113 participants. There was no statistically significant difference in infection rates between the masked and unmasked group in any of the trials." Meanwhile, Li et al. (2021) – based on six case-control studies – conclude, "In general, wearing a mask was associated with a significantly reduced risk of COVID-19 infection (OR = 0.38, 95% CI: 0.21-0.69, $I^2 = 54.1\%$).

Only business closure consistently shows evidence of a negative relationship with COVID-19 mortality, but the variation in the estimated effect is large. Three studies find little to no effect, and three find large effects. Two of the larger effects are related to closing bars and restaurants. The "close business" category in Chernozhukov et al. (2021) is an average of closed businesses, restaurants, and movie theaters, while that same category is "closing restaurants and bars" in Spiegel and Tookes (2021). The last study finding a large effect is Bongaerts et al. (2021), the only eligible single-country study.[45]

As a final observation on Table 7, studies with fewer quality dimensions seem to find larger effects, but the pattern is not systematic.[46]

Table 7: Overview of estimates from studies of specific NPIs

	Lockdown (complete/ partial)	Facemasks/ Employee face masks	Business closure (/bars & restaurants)	Border closure (/quarantine)	School closures	Limiting gatherings	Quality dimensions
Chernozhukov et al. (2021)		-34.0%	-28.6%				4
Bongaerts et al. (2021)			-31.6%				2
Chaudhry et al. (2020)*	0.0%			0.0%			2
Toya & Skidmore (2021)	0.5%			-0.1%			3
Aparicio & Grossbard (2021)			-1.3%		0.5%	0.8%	4
Auger et al. (2020)					-58.0%		2
Leffler et al. (2020)	1.7%			-15.6%			2
Stokes et al. (2020)			0.3%	-24.6%	-0.1%	-6.3%	3
Spiegel & Tookes (2021)		-13.5%	-50.2%			11.8%	3
Bonardi et al. (2020)*	0.0%			0.0%			1
Guo et al. (2021)			-0.4%	36.3%	-0.2%	5.7%	3
Precision-weighted average	0.6%	-21.2%	-10.6%	-0.1%	-4.4%	1.6%	
Arithmetic average	0.6%	-23.8%	-18.6%	-0.7%	-14.4%	3.0%	
Median	0.3%	-23.8%	-14.9%	0.0%	-0.1%	3.2%	
4 of 4 quality dimensions	n/a [0]	-34.0% [1]	-2.9% [2]	n/a [0]	0.5% [1]	0.8% [1]	
3 of 4 quality dimensions	0.5% [1]	-13.5% [1]	-21.5% [3]	0.0% [3]	-0.1% [2]	5.6% [3]	
2 of 4 quality dimensions or fewer	1.7% [2]	n/a [1]	-31.6% [2]	-15.6% [2]	-58.0% [1]	n/a [1]	

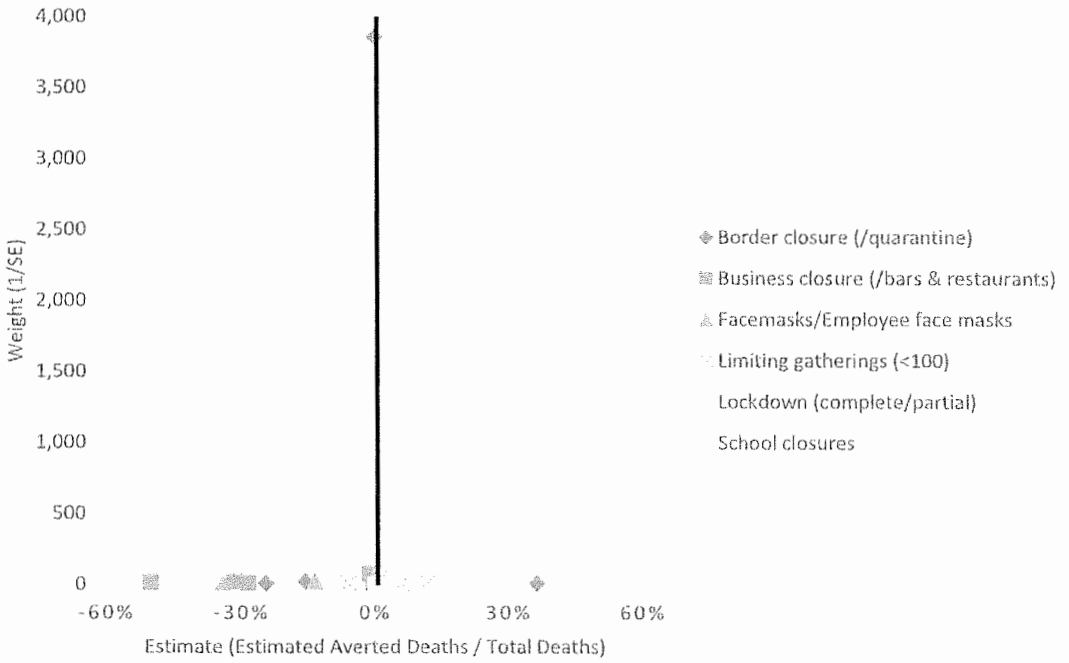
*Note: * It is not possible to derive common estimates and standard errors from Chaudhry et al. (2020) and Bonardi et al. (2020). Chaudhry et al. (2020) states that the effect of the various NPIs is insignificant without listing the estimates and standard errors. Bonardi et al. (2020) states that partial or regional lockdowns are as effective as stricter NPIs but does not provide information to calculate common estimates. Instead, we assume the estimate is 0% when calculating arithmetic average and median, while the estimates are excluded from the calculation of precision-weighted averages because there are no standard errors.*

[45] Bongaerts et al. (2021) (implicitly) assume that municipalities with different exposures to closed sectors are not inherently different, which may be a relatively strong assumption and could potentially drive their results.

[46] We saw with SIPOs that studies based on short data series tended to find larger effects than studies based on short data series. This is also somewhat true for studies examining multiple specific measures. If we focus on studies with long data series (>May 31st, 2020), the precision-weighted estimates are as follows (average for all studies in parentheses for easy comparison): Lockdown (complete/partial): 0.5% (0.6%), Facemasks/Employee face masks: -21.2% (-21.2%), Business closures (/bars & restaurants): -8.1% (-10.6%), Border closures (/quarantine): -0.1% (-0.1%), School closures: 0.5% (-4.4%), Limiting gatherings: 1.4% (1.6%).

Figure 7 shows a funnel plot for all estimates in Table 7, except Chaudhry et al. (2020) and Bonardi et al. (2020), where common standard errors cannot be derived. Two estimates from Toya and Skidmore (2020) stands out with a precision far higher than those of other studies, and estimates are placed with some 'tail' to the left, which could indicate some publication bias, i.e. reluctance to publish results that show large positive (more deaths) effects of lockdowns. The most precise estimates are gathered around 0%, while less precise studies are spread out between -58% and 36%. The precision-weighted average of all estimates across all NPIs is -0.6%.

Figure 7: Funnel plot for estimates from studies of specific NPIs



Note: The figure displays all estimates except two (se text in figure) of specific NPIs and the precision of the estimate defined as one over the standard error. Studies where standard errors are not available are not included.

Overall conclusion on specific NPIs

Because of the heterogeneity in NPIs across studies, it is difficult to draw strong conclusions based on the studies of multiple specific measures. We find no evidence that lockdowns, school closures, border closures, and limiting gatherings have had a noticeable effect on COVID-19 mortality. There is some evidence that business closures reduce COVID-19 mortality, but the variation in estimates is large and the effect seems related to closing bars. There may be an effect of mask mandates, but just two studies look at this, one of which one only looks at the effect of employee mask mandates.

5 Concluding observations

Public health experts and politicians have – based on forecasts in epidemiological studies such as that of Imperial College London (Ferguson et al. (2020) – embraced compulsory lockdowns as an effective method for arresting the pandemic. But, have these lockdown policies been effective in curbing COVID-19 mortality? This is the main question answered by our meta-analysis.

Adopting a systematic search and title-based screening, we identified 1,048 studies published by July 1st, 2020, which potentially look at the effect of lockdowns on mortality rates. To answer our question, we focused on studies that examine the actual impact of lockdowns on COVID-19 mortality rates based on registered cross-sectional mortality data and a counterfactual difference-in-difference approach. Out of the 1,048 studies, 34 met our eligibility criteria.

Conclusions

Overall, our meta-analysis fails to confirm that lockdowns have had a large, significant effect on mortality rates. Studies examining the relationship between lockdown strictness (based on the OxCGRT stringency index) find that the average lockdown in Europe and the United States only reduced COVID-19 mortality by 0.2% compared to a COVID-19 policy based solely on recommendations. Shelter-in-place orders (SIPOs) were also ineffective. They only reduced COVID-19 mortality by 2.9%.

Studies looking at specific NPIs (lockdown vs. no lockdown, facemasks, closing non-essential businesses, border closures, school closures, and limiting gatherings) also find no broad-based evidence of noticeable effects on COVID-19 mortality. However, closing non-essential businesses seems to have had some effect (reducing COVID-19 mortality by 10.6%), which is likely to be related to the closure of bars. Also, masks may reduce COVID-19 mortality, but there is only one study that examines universal mask mandates. The effect of border closures, school closures and limiting gatherings on COVID-19 mortality yields precision-weighted estimates of -0.1%, -4.4%, and 1.6%, respectively. Lockdowns (compared to no lockdowns) also do not reduce COVID-19 mortality.

Discussion

Overall, we conclude that lockdowns are not an effective way of reducing mortality rates during a pandemic, at least not during the first wave of the COVID-19 pandemic. Our results are in line with the World Health Organization Writing Group (2006), who state, "Reports from the 1918 influenza pandemic indicate that social-distancing measures did not stop or appear to dramatically reduce transmission [...] In Edmonton, Canada, isolation and quarantine were instituted; public meetings were banned; schools, churches, colleges, theaters, and other public gathering places were closed; and business hours were restricted without obvious impact on the epidemic." Our findings are also in line with Allen's (2021) conclusion: "The most recent research has shown that lockdowns have had, at best, a marginal effect on the number of Covid-19 deaths." Poeschl and Larsen (2021) conclude that "interventions are generally effective in

mitigating COVID-19 spread". But, 9 of the 43 (21%) results they review find "no or uncertain association" between lockdowns and the spread of COVID-19, suggesting that evidence from that own study contradicts their conclusion.

The findings contained in Johanna et al. (2020) are in contrast to our own. They conclude that "for lockdown, ten studies consistently showed that it successfully reduced the incidence, onward transmission, and mortality rate of COVID-19." The driver of the difference is three-fold. First, Johanna et al. include modelling studies (10 out of a total of 14 studies), which we have explicitly excluded. Second, they included interrupted time series studies (3 of 14 studies), which we also exclude. Third, the only study using a difference-in-difference approach (as we have done) is based on data collected before May 1st, 2020. We should mention that our results indicate that early studies find relatively larger effects compared to later studies.

Our main conclusion invites a discussion of some issues. Our review does not point out *why* lockdowns did not have the effect promised by the epidemiological models of Imperial College London (Ferguson et al. (2020). We propose four factors that might explain the difference between our conclusion and the view embraced by some epidemiologists.

First, people respond to dangers outside their door. When a pandemic rages, people believe in social distancing regardless of what the government mandates. So, we believe that Allen (2021) is right, when he concludes, "The ineffectiveness [of lockdowns] stemmed from individual changes in behavior: either non-compliance or behavior that mimicked lockdowns." In economic terms, you can say that the demand for costly disease prevention efforts like social distancing and increased focus on hygiene is high when infection rates are high. Contrary, when infection rates are low, the demand is low and it may even be morally and economically rational not to comply with mandates like SIPOs, which are difficult to enforce. Herby (2021) reviews studies which distinguish between mandatory and voluntary behavioral changes. He finds that – on average – voluntary behavioral changes are 10 times as important as mandatory behavioral changes in combating COVID-19. If people voluntarily adjust their behavior to the risk of the pandemic, closing down non-essential businesses may simply reallocate consumer visits away from "nonessential" to "essential" businesses, as shown by Goolsbee and Syverson (2021), with limited impact on the total number of contacts.[47] This may also explain why epidemiological model simulations such as Ferguson et al. (2020) – which do not model behavior endogenously – fail to forecast the effect of lockdowns.

Second, mandates only regulate a fraction of our potential contagious contacts and can hardly regulate nor enforce handwashing, coughing etiquette, distancing in supermarkets, etc. Countries like Denmark, Finland, and Norway that realized success in keeping COVID-19 mortality rates relatively low allowed people to go to work, use public transport, and meet privately at home during the first lockdown. In these countries, there were ample opportunities to legally meet with others.

[47] In economic terms, lockdowns are substitutes for – not complements to – voluntary behavioral changes.

Third, even if lockdowns are successful in initially reducing the spread of COVID-19, the behavioral response may counteract the effect completely, as people respond to the lower risk by changing behavior. As Atkeson (2021) points out, the economic intuition is straightforward. If closing bars and restaurants causes the prevalence of the disease to fall toward zero, the demand for costly disease prevention efforts like social distancing and increased focus on hygiene also falls towards zero, and the disease will return.[48]

Fourth, unintended consequences may play a larger role than recognized. We already pointed to the possible unintended consequence of SIPOs, which may isolate an infected person at home with his/her family where he/she risks infecting family members with a higher viral load, causing more severe illness. But often, lockdowns have limited peoples' access to safe (outdoor) places such as beaches, parks, and zoos, or included outdoor mask mandates or strict outdoor gathering restrictions, pushing people to meet at less safe (indoor) places. Indeed, we do find some evidence that limiting gatherings was counterproductive and increased COVID-19 mortality.

One objection to our conclusions may be that we do not look at the role of timing. If timing is very important, differences in timing may empirically overrule any differences in lockdowns. We note that this objection is not necessarily in contrast to our results. If timing is very important relative to strictness, this suggests that well-timed, but very mild, lockdowns should work as well as, or better than, less well-timed but strict lockdowns. This is not in contrast to our conclusion, as the studies we reviewed analyze the effect of lockdowns compared but to doing very little (see Section 3.1 for further discussion). However, there is little solid evidence supporting the timing thesis, because it is inherently difficult to analyze (see Section 2.2 for further discussion). Also, even if it can be empirically stated that a well-timed lockdown is effective in combating a pandemic, it is doubtful that this information will ever be useful from a policy perspective.

But, what explains the differences between countries, if not differences in lockdown policies? Differences in population age and health, quality of the health sector, and the like are obvious factors. But several studies point at less obvious factors, such as culture, communication, and coincidences. For example, Frey et al. (2020) show that for the same policy stringency, countries with more obedient and collectivist cultural traits experienced larger declines in geographic mobility relative to their more individualistic counterpart. Data from Germany Laliotis and Minos (2020) shows that the spread of COVID-19 and the resulting deaths in predominantly Catholic regions with stronger social and family ties were much higher compared to non-Catholic ones at the local NUTS 3 level.[49]

Government communication may also have played a large role. Compared to its Scandinavian neighbors, the communication from Swedish health authorities was far more subdued and embraced the idea of public health vs. economic trade-offs. This may explain why Helsingen et

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[48] This kind of behavior response may also explain why Subramanian and Kumar (2021) find that increases in COVID-19 cases are unrelated to levels of vaccination across 68 countries and 2947 counties in the United States. When people are vaccinated and protected against severe disease, they have less reason to be careful.

[49] The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU and the UK. There are 1215 regions at the NUTS 3-level.

al. (2020), found, based on questionnaire data collected from mid-March to mid-April, 2020, that even though the daily COVID-19 mortality rate was more than four times higher in Sweden than in Norway, Swedes were less likely than Norwegians to not meet with friends (55% vs. 87%), avoid public transportation (72% vs. 82%), and stay home during spare time (71% vs. 87%). That is, despite a more severe pandemic, Swedes were less affected in their daily activities (legal in both countries) than Norwegians.

Many other factors may be relevant, and we should not underestimate the importance of coincidences. An interesting example illustrating this point is found in Arnarson (2021) and Björk et al. (2021), who show that areas where the winter holiday was relatively late (in week 9 or 10 rather than week 6, 7 or 8) were hit especially hard by COVID-19 during the first wave because the virus outbreak in the Alps could spread to those areas with ski tourists. Arnarson (2021) shows that the effect persists in later waves. Had the winter holiday in Sweden been in week 7 or week 8 as in Denmark, the Swedish COVID-19 situation could have turned out very differently.[50]

Policy implications

In the early stages of a pandemic, before the arrival of vaccines and new treatments, a society can respond in two ways: mandated behavioral changes or voluntary behavioral changes. Our study fails to demonstrate significant positive effects of mandated behavioral changes (lockdowns). This should draw our focus to the role of voluntary behavioral changes. Here, more research is needed to determine how voluntary behavioral changes can be supported. But it should be clear that one important role for government authorities is to provide information so that citizens can voluntarily respond to the pandemic in a way that mitigates their exposure.

Finally, allow us to broaden our perspective after presenting our meta-analysis that focuses on the following question: "What does the evidence tell us about the effects of lockdowns on mortality?" We provide a firm answer to this question: The evidence fails to confirm that lockdowns have a significant effect in reducing COVID-19 mortality. The effect is little to none.

The use of lockdowns is a unique feature of the COVID-19 pandemic. Lockdowns have not been used to such a large extent during any of the pandemics of the past century. However, lockdowns during the initial phase of the COVID-19 pandemic have had devastating effects. They have contributed to reducing economic activity, raising unemployment, reducing schooling, causing political unrest, contributing to domestic violence, and undermining liberal democracy. These costs to society must be compared to the benefits of lockdowns, which our meta-analysis has shown are marginal at best. Such a standard benefit-cost calculation leads to a strong conclusion: lockdowns should be rejected out of hand as a pandemic policy instrument.

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[50] Another case of coincidence is illustrated by Shenoy et al. (2022), who find that areas that experienced rainfall early in the pandemic realized fewer deaths because the rainfall induced social distancing.

6 Appendix A. The role of timing

Some of the included papers study the importance of the timing of lockdowns, while several other papers only looking at timing of (but not on the inherent effect of) lockdowns have been excluded from the literature list in this review. There's no doubt that being prepared for a pandemic and knowing when it arrives at your doorstep is vital. However, two problems arise with respect to imposing early lockdowns.

First of all, it was virtually impossible to determine the right timing when COVID-19 hit Europe and the United States. The World Health Organization declared the outbreak of a pandemic on 11 March 2020, but at that date Italy had already registered 13.7 COVID-19-deaths per million (all infected before approximately 22 February, because of the roughly 18 day gap between infection and death, c.f. e.g.. Bjørnskov (2021a)). On 29 March 2020, 18 days after WHO declared the outbreak a pandemic and the earliest a lockdown response to WHO's announcement could have an effect, the death toll in Italy was a staggering 178 COVID-19-deaths per million with an additionally 13 per million dying each day.

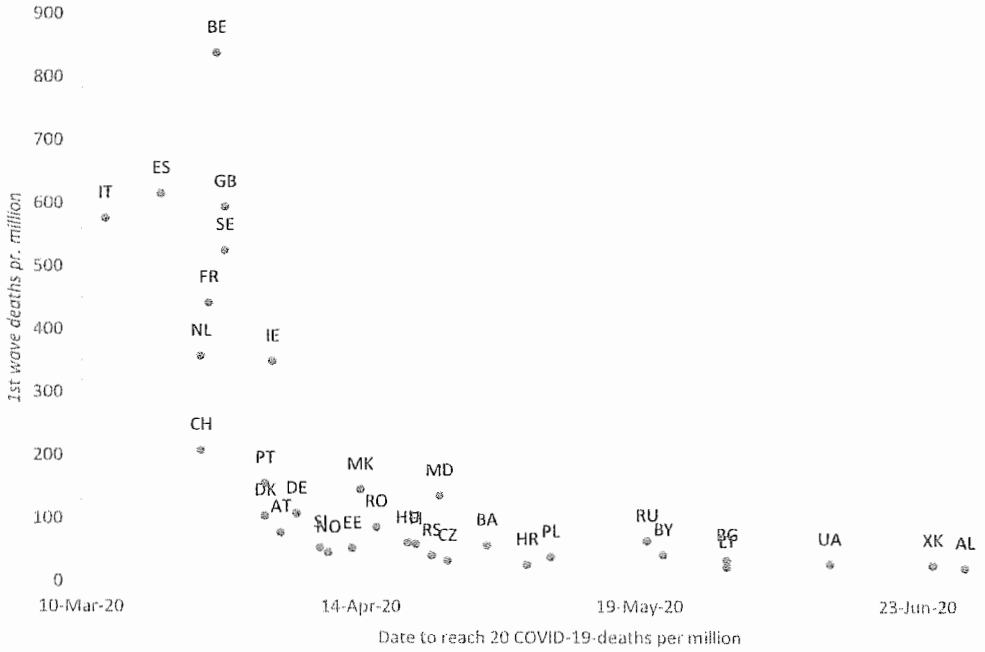
There are reasons to believe that many countries and regions were hit particularly hard during the first wave of COVID, because they had no clue about how bad it really was. This point is illustrated in Figure 8 (and Figure 9), which show that countries (and states), which were hit hard and early, experienced large death tolls compared to countries where the pandemic had a slower start. Björk et al. (2021) and Arnarson (2021) show that areas with a winter holiday in week 10 and – especially – week 9 were hit hard, because they imported cases from the Alps *before* they knew the pandemic was wide spread at the ski resorts. Hence, while acting early by warning citizens and closing business may be an effective strategy; this was not a feasible strategy for most countries in the spring of 2020.

The second problem is that it is extremely difficult to differentiate between the effect of public awareness and the effect of lockdowns. If people and politicians react to the same information, for example deaths in geographical neighboring countries (many EU-countries reacted to deaths in Italy) or in another part of the same country, the effect of lockdowns cannot easily be separated from the effect of voluntary social distancing or, use of hand sanitizers. Hence, we find it problematic to use national lockdowns and differences in the progress of the pandemic in different regions to say anything about the effect of early lockdowns on the pandemic, as the estimated effect might just as well come from voluntary behavior changes, when people in Southern Italy react to the situation in Northern Italy.

We have seen no studies which we believe credibly separate the effect of early lockdown from the effect of early voluntary behavior changes. Instead, the estimates in these studies capture the effects of lockdowns *and* voluntary behavior changes. As Herby (2021) illustrates, voluntary behavior changes are essential to a society's response to an pandemic and can account for up to 90% of societies' total response to the pandemic.

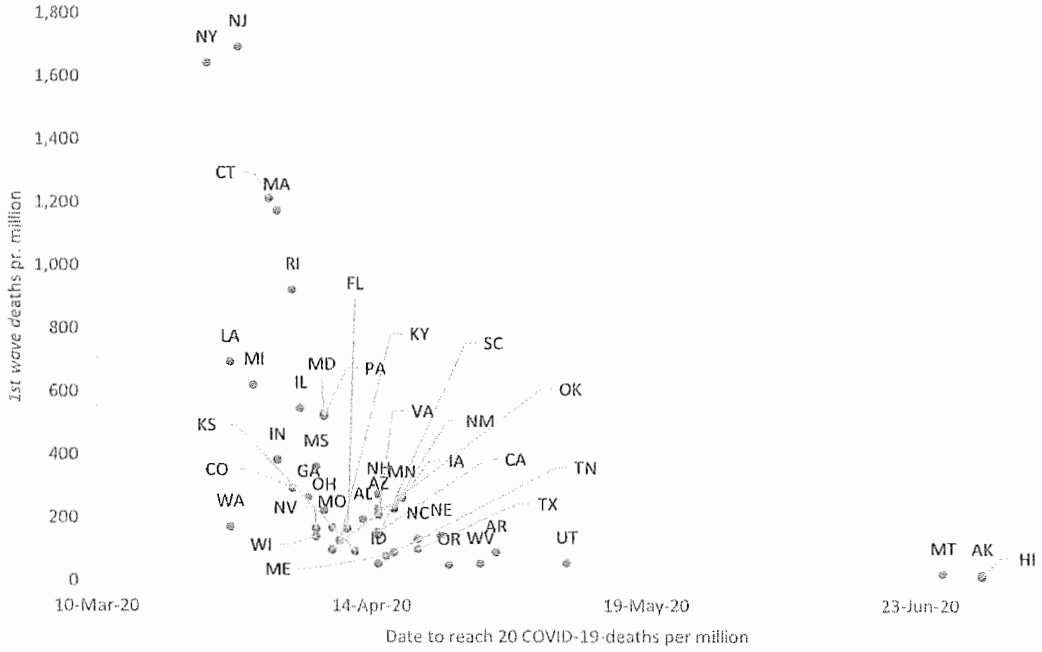
Including these studies will greatly overestimate the effect of lockdowns, and, hence, we chose not to include studies focusing on timing of lockdowns in our review.

Figure 8: Taken by surprise. The importance of having time to prepare in Europe



Description: European countries with more than one million citizens.
Source: Our World in Data

Figure 9: Taken by surprise. The importance of having time to prepare in U.S. states



Description: U.S. states with more than one million citizens.
Source: Our World in Data

7 Appendix B. Supplementary information

7.1 Excluded studies

Below is a list will the studies excluded during the eligibility phase of our identification process and a short description of our basis for excluding the study.

Table 8: Studies excluded during the eligibility phase of our identification process

1. Study (Author & title)	2. Reason for exclusion
Alemán et al. (2020); "Evaluating the effectiveness of policies against a pandemic"	Too few observations
Alshammari et al. (2021); "Are countries' precautionary actions against COVID-19 effective? An assessment study of 175 countries worldwide"	Is purely descriptive
Amuedo-Dorantes et al. (2020); "Timing is Everything when Fighting a Pandemic: COVID-19 Mortality in Spain"	Duplicate
Amuedo-Dorantes et al. (2021); "Early adoption of non-pharmaceutical interventions and COVID-19 mortality"	Only looks at timing
Amuedo-Dorantes, Kaushal and Muchow (2020); "Is the Cure Worse than the Disease? County-Level Evidence from the COVID-19 Pandemic in the United States"	Duplicate
Amuedo-Dorantes, Kaushal and Muchow (2021); "Timing of social distancing policies and COVID-19 mortality: county-level evidence from the U.S."	Only looks at timing
Arruda et al. (2021); "ASSESSING THE IMPACT OF SOCIAL DISTANCING ON COVID-19 CASES AND DEATHS IN BRAZIL: AN INSTRUMENTED DIFFERENCE-IN-	Social distancing (not
Bakolis et al. (2021); "Changes in daily mental health service use and mortality at the commencement and lifting of COVID-19 'lockdown' policy in 10 UK sites: a regression	Uses a time series approach
Bardey, Fernández and Gravel (2021); "Coronavirus and social distancing: do non-pharmaceutical-interventions work (at least) in the short run?"	Only looks at timing
Berardi et. Al. (2020); "The COVID-19 pandemic in Italy: policy and technology impact on health and non-health outcomes"	Too few observations
Bhalla (2020); "Lockdowns and Closures vs COVID-19: COVID Wins"	Uses modelling
Björk et al. (2021); "Impact of winter holiday and government responses on mortality in Europe during the first wave of the COVID-19 pandemic"	Only looks at timing
Bongaerts, Mazzola and Wagner (2020); "Closed for business"	Duplicate
Born, Dietrich and Müller (2021); "The lockdown effect: A counterfactual for Sweden"	Synthetic control study
Born, Dietrich and Müller (2021); "The lockdown effect: A counterfactual for Sweden"	Duplicate
Bushman et al. (2020); "Effectiveness and compliance to social distancing during COVID-19"	Social distancing (not
Castaneda and Saygili (2020); "The effect of shelter-in-place orders on social distancing and the spread of the COVID-19 pandemic: a study of Texas"	Uses a time series approach
Cerqueti et al. (2021); "The sooner the better: lives saved by the lockdown during the COVID-19 outbreak. The case of Italy"	Synthetic control study
Chernozhukov, Kasahara and Schrimpf (2021); "Mask mandates and other lockdown policies reduced the spread of COVID-19 in the U.S."	Duplicate
Chin et al. (2020); "Effects of non-pharmaceutical interventions on COVID-19: A Tale of Three Models"	Uses modelling
Cho (2020); "Quantifying the impact of nonpharmaceutical interventions during the COVID-19 outbreak: The case of Sweden"	Synthetic control study
Coccia (2020); "The effect of lockdown on public health and economic system: findings from first wave of the COVID-19 pandemic for designing effective strategies to cope	Only looks at timing
Coccia (2021); "Different effects of lockdown on public health and economy of countries: Results from first wave of the COVID-19 pandemic"	Too few observations
Conyon and Thomsen (2021); "COVID-19 in Scandinavia"	Synthetic control study
Conyon et al. (2020); "Lockdowns and COVID-19 deaths in Scandinavia"	Too few observations
Dave et al. (2020); "Did the Wisconsin Supreme Court restart a COVID-19 epidemic? Evidence from a natural experiment"	Synthetic control study
Delis, Iosifidi and Tasiou (2021); "Efficiency of government policy during the COVID-19 pandemic"	Do not look at mortality
Dreher et al. (2021); "Policy interventions, social distancing, and SARS-CoV-2 transmission in the United States: a retrospective state-level analysis"	Do not look at mortality
Duchemin, Veber and Boussau (2020); "Bayesian investigation of SARS-CoV-2-related mortality in France"	Uses modelling
Fair et. Al. (2021); "Estimating COVID-19 cases and deaths prevented by non-pharmaceutical interventions in 2020-2021, and the impact of individual actions: a retrospective	Uses modelling
Filias (2020); "The impact of government policies effectiveness on the officially reported deaths attributed to covid-19."	Student paper
Fowler et al. (2021); "Stay-at-home orders associate with subsequent decreases in COVID-19 cases and fatalities in the United States"	Duplicate
Friedson et al. (2020); "Did California's shelter-in-place order work? Early coronavirus-related public health effects"	Duplicate
Friedson et al. (2020); "Shelter-in-place orders and public health: evidence from California during the COVID-19 pandemic"	Synthetic control study
Fuss, Weizman and Tan (2020); "COVID19 pandemic: how effective are interventive control measures and is a complete lockdown justified? A comparison of countries and	Do not look at mortality
Ghosh, Ghosh and Narymanchi (2020); "A Study on The Effectiveness of Lock-down Measures to Control The Spread of COVID-19"	Synthetic control study
Glogowsky et al. (2021); "How Effective Are Social Distancing Policies? Evidence on the Fight Against COVID-19"	Only looks at timing
Glogowsky, Hansen and Schächtele (2020); "How effective are social distancing policies? Evidence on the fight against COVID-19 from Germany"	Duplicate
Glogowsky, Hansen and Schächtele (2020); "How Effective Are Social Distancing Policies? Evidence on the Fight Against COVID-19 from Germany"	Duplicate
Gordon, Grafton and Steinshamn (2021); "Cross-country effects and policy responses to COVID-19 in 2020: The Nordic countries"	Do not look at mortality
Gordon, Grafton and Steinshamn (2021); "Statistical Analyses of the Public Health and Economic Performance of Nordic Countries in Response to the COVID-19 Pandemic"	Too few observations
Guo et al. (2020); "Social distancing interventions in the United States: An exploratory investigation of determinants and impacts"	Duplicate
Huber and Langen (2020); "The impact of response measures on COVID-19-related hospitalization and death rates in Germany and Switzerland"	Duplicate
Huber and Langen (2020); "Timing matters: the impact of response measures on COVID-19-related hospitalization and death rates in Germany and Switzerland"	Only looks at timing
Jain et al. (2020); "A comparative analysis of COVID-19 mortality rate across the globe: An extensive analysis of the associated factors"	Do not look at mortality
Juranek and Zoutman (2021); "The effect of non-pharmaceutical interventions on the demand for health care and mortality: evidence on COVID-19 in Scandinavia"	Too few observations
Kakpo and Nuhu (2020); "Effects of Social Distancing on COVID-19 Infections and Mortality in the U.S."	Social distancing (not
Kapoor and Ravi (2020); "Impact of national lockdown on COVID-19 deaths in select European countries and the U.S. using a Changes-in-Changes model"	Too few observations
Khatiwada and Chalise (2020); "Evaluating the efficiency of the Swedish government policies to control the spread of Covid-19."	Student paper
Korevaar et al. (2020); "Quantifying the impact of U.S. state non-pharmaceutical interventions on COVID-19 transmission"	Do not look at mortality
Kumar et. Al. (2020); "Prevention-Versus Promotion-Focus Regulatory Efforts on the Disease Incidence and Mortality of COVID-19: A Multinational Diffusion Study Using	Do not look at mortality
Le et al. (2020); "Impact of government-imposed social distancing measures on COVID-19 morbidity and mortality around the world"	Uses a time series approach
Liang et al. (2020); "Covid-19 mortality is negatively associated with test number and government effectiveness"	Not effect of lockdowns
Mader and Rütternauer (2021); "The effects of non-pharmaceutical interventions on COVID-19-related mortality: A generalized synthetic control approach across 169 countries"	Synthetic control study
Matzinger and Skinner (2020); "Strong impact of closing schools, closing bars and wearing masks during the Covid-19 pandemic: results from a simple and revealing analysis"	Uses modelling
Mccafferty and Ashley (2020); "Covid-19 Social Distancing Interventions by State Mandate and their Correlation to Mortality in the United States"	Duplicate
Medline et al. (2020); "Evaluating the impact of stay-at-home orders on the time to reach the peak burden of Covid-19 cases and deaths: does timing matter?"	Only looks at timing

1. Study (Author & title)	2. Reason for exclusion
Mu et al. (2020); "Effect of social distancing interventions on the spread of COVID-19 in the state of Vermont"	Uses modelling
Nakamura (2020); "The Impact of Rapid State Policy Response on Cumulative Deaths Caused by COVID-19"	Student paper
Neidhöfer and Neidhöfer (2020); "The effectiveness of school closures and other pre-lockdown COVID-19 mitigation strategies in Argentina, Italy, and South Korea"	Synthetic control study
Oliveira (2020); "Does' Staying at Home'Save Lives? An Estimation of the Impacts of Social Isolation in the Registered Cases and Deaths by COVID-19 in Brazil"	Social distancing (not
Palladina et al. (2020); "Effect of Implementation of the Lockdown on the Number of COVID-19 Deaths in Four European Countries"	Uses a time series approach
Palladina et al. (2020); "Effect of timing of implementation of the lockdown on the number of deaths for COVID-19 in four European countries"	Duplicate
Palladino et al. (2020); "Excess deaths and hospital admissions for COVID-19 due to a late implementation of the lockdown in Italy"	Uses a time series approach
Peixoto et al. (2020); "Rapid assessment of the impact of lockdown on the COVID-19 epidemic in Portugal"	Uses modelling
Piovani et. Al. (2021); "Effect of early application of social distancing interventions on COVID-19 mortality over the first pandemic wave: An analysis of longitudinal data from 37	Only looks at timing
Reinbold (2021); "Effect of fall 2020 K-12 instruction types on CoViD-19 cases, hospital admissions, and deaths in Illinois counties"	Synthetic control study
Renne, Roussellet and Schwenkler (2020); "Preventing COVID-19 Fatalities: State versus Federal Policies"	Uses modelling
Siedner et al. (2020); "Social distancing to slow the U.S. COVID-19 epidemic: Longitudinal pretest–posttest comparison group study"	Duplicate
Siedner et al. (2020); "Social distancing to slow the U.S. COVID-19 epidemic: Longitudinal pretest–posttest comparison group study"	Uses a time series approach
Silva, Filho and Fernandes (2020); "The effect of lockdown on the COVID-19 epidemic in Brazil: evidence from an interrupted time series design"	Uses a time series approach
Stamam et al. (2020); "IMPACT OF LOCKDOWN MEASURE ON COVID-19 INCIDENCE AND MORTALITY IN THE TOP 31 COUNTRIES OF THE WORLD."	Uses a time series approach
Steinegger et al. (2021); "Retrospective study of the first wave of COVID-19 in Spain: analysis of counterfactual scenarios"	Only looks at timing
Stephens et al. (2020); "Does the timing of government COVID-19 policy interventions matter? Policy analysis of an original database."	Only looks at timing
Supino et al. (2020); "The effects of containment measures in the Italian outbreak of COVID-19"	Uses a time series approach
Timelli and Girardi (2021); "Effect of timing of implementation of containment measures on Covid-19 epidemic. The case of the first wave in Italy"	Only looks at timing
Trivedi and Das (2020); "Effect of the timing of stay-at-home orders on COVID-19 infections in the United States of America"	Only looks at timing
Umer and Khan (2020); "Evaluating the Effectiveness of Regional Lockdown Policies in the Containment of Covid-19: Evidence from Pakistan"	Too few observations
VoPham et al. (2020); "Effect of social distancing on COVID-19 incidence and mortality in the U.S."	Do not look at mortality
Wu and Wu (2020); "Stay-at-home and face mask policies intentions inconsistent with incidence and fatality during U.S. COVID-19 pandemic"	Too few observations
Xu et al. (2020); "Associations of Stay-at-Home Order and Face-Masking Recommendation with Trends in Daily New Cases and Deaths of Laboratory-Confirmed COVID-19 in	Do not look at mortality
Yehya, Venkataramani and Harhay (2020); "Statewide Interventions and Coronavirus Disease 2019 Mortality in the United States: An Observational Study"	Only looks at timing
Ylli et al. (2020); "The lower COVID-19 related mortality and incidence rates in Eastern European countries are associated with delayed start of community circulation Alban	Not effect of lockdowns

7.2 Interpretation of estimates and conversion to common estimates

In Table 9, we describe for each study used in the meta-analysis how we interpret their results and convert the estimates to our common estimate. Standard errors are converted such that the t-value, calculated based on common estimates and standard errors, is unchanged. When confidence intervals are reported rather than standard errors, we calculate standard errors using t-distribution with ∞ degrees of freedom (i.e. 1.96 for 95% confidence interval).

Table 9: Notes on studies included in the meta-analysis

1. Study (Author & title)	2. Date Published	3. Journal	4. Comments regarding meta-analysis
Alderman and Harjoto (2020); "COVID-19: U.S. shelter-in-place orders and demographic characteristics linked to cases, mortality, and recovery rates"	26-Nov-20	Transforming Government: People, Process and Policy	We use the 1% effect noted by the authors in "We find that the natural log of the duration (in days) that the state instituted shelter-in-place reduces percentages of mortality by 0.0001%, or approximately 1% of the means of percentages of deaths per capita in our sample. The standard error is calculated on basis of the t-value in Table 3.
Aparicio and Grossbard (2021); "Are Covid Fatalities in the U.S. Higher than in the EU, and If so, Why?"	16-Jan-21	Review of Economics of the Household	We use estimates from Table 3, model 5. For each estimate the common estimate is calculated as (difference in COVID-19 mortality with NPI)/(difference in COVID-19 mortality without NPI)-1, where (difference in COVID-19 mortality with NPI) is 237.89 (Table 2 states that deaths per million is 406.99 in U.S. and 169.10 in Europe) and (difference in COVID-19 mortality without NPI) is estimated as exp(ln(difference in COVID-19 mortality with NPI)-estimate).
Ashraf (2020); "Socioeconomic conditions, government interventions and health outcomes during COVID-19"	1-Jul-20	ResearchGate	It is unclear whether they prefer the model with or without the interaction term. In the meta-analysis, we use an average of -0.326 (Table 3, without) and -0.073 (Table 6, with) deaths per million per stringency point (i.e. -0.200). The common estimate is the average effect in Europe and United States respectively calculated as (Actual COVID-19 mortality) / (COVID-19 mortality with recommendation policy) -1, where (COVID-19 mortality with recommendation policy) is calculated as ((Actual COVID-19 mortality) - Estimate x Difference in stringency x population). Stringencies in Europe and United States are equal to the average stringency from March 16th to April 15th 2020 (76 and 74 respectively) and the stringency for the policy based solely on recommendations is 44 following Hale et al. (2020).

1. Study (Author & title)	2. Date Published	3. Journal	4. Comments regarding meta-analysis
Auger et al. (2020); "Association between statewide school closure and COVID-19 incidence and mortality in the U.S."	1-Sep-20	JAMA	Estimate that school closure was associated with a 58% decline in COVID-19 mortality and that the effect was largest in states with low cumulative incidence of COVID-19 at the time of school closure. States with the lowest incidence of COVID-19 had a −72% relative change in incidence compared with −49% for those states with the highest cumulative incidence.
Berry et al. (2021); "Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic"	24-Feb-21	PNAS	The estimated effect of SIPO's, an increase in deaths by 0,654 per million after 14 days (significant, cf. Fig. 2), is converted to a relative effect on a state basis based on data from OurWorldInData. For states which did implement SIPO, we calculate the number of deaths without SIPO as the number of official COVID-19 deaths 14 days after SIPO was implemented minus 0,654 extra deaths per million. For states which did not implement SIPO, we calculate the number of deaths with SIPO as the number of official COVID-19 deaths 14 days after March 31 2020 plus 0,654 extra deaths per million. We use March 31 2020 as this was the average date on which SIPO was implemented in the 40 states which did implement SIPO. Using this approximation, the effect of SIPO's in the U.S. is 1,1% more deaths after 14 days. Common standard errors are not available.
Bjørnskov (2021a); "Did Lockdown Work? An Economist's Cross-Country Comparison"	29-Mar-21	CESifo Economic Studies	We use estimates from Table 2 (four weeks). Common estimate is calculated as the average of the effect in Europe and United States, where the effect for each is calculated as (ln(policy stringency) - ln(recommendation stringency)) x estimate.
Blanco et al. (2020); "Do Coronavirus Containment Measures Work? Worldwide Evidence"	1-Dec-20	World Bank Group	The study is not included in the meta-analysis, as it looks at the effect of NPIs on growth rates and does not include an estimate of the effect on total mortality.
Bonardi et al. (2020); "Fast and local: How did lockdown policies affect the spread and severity of the covid-19"	8-Jun-20	0	Find that, world-wide, internal NPIs have prevented about 650,000 deaths (3.11 deaths were prevented for each death that occurred, i.e. 76% effect). However, this effect is for any lockdown including a Swedish lockdown. They do not find an extra effect of stricter lockdowns and state that "our results point to the fact that people might adjust their behaviors quite significantly as partial measures are implemented, which might be enough to stop the spread of the virus." Hence, whether the baseline is Sweden, which implemented a ban on large gatherings early in the pandemic, or the baseline is "doing nothing" can affect the magnitude of the estimated impacts. Since all Western countries did something and estimates in other reviewed studies are relative to doing less – and, hence not to doing nothing, we report the result from Bonardi et al. as compared to "doing less." Hence, for Bonardi et al. we use 0% as the common estimate in the meta-analysis for each NPI (SIPO, regional lockdown, partial lockdown, and border closure (stage 1, stage 2 and full) because all NPIs are insignificant (compared to Sweden's "doing the least"-lockdown).
Bongaerts et al. (2021); "Closed for business: The mortality impact of business closures during the Covid-19 pandemic"	14-May-21	PLOS ONE	Business shutdown saved 9,439 Italian lives by 13th 2020. This corresponds to 32%, as there were 20,465 COVID-19-deaths in Italy by mid April 2020.
Chaudhry et al. (2020); "A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes"	1-Aug-20	EClinacal-Medicine	Finds no effect of partial border closure, complete border closure, partial lockdown (physical distancing measures only), complete lockdown (enhanced containment measures including suspension of all non-essential services), and curfews. In the meta-analysis we use a common estimate of 0%, as estimates and standard errors are not available.
Chernozhukov et al. (2021); "Causal impact of masks, policies, behavior on early covid-19 pandemic in the U.S."	1-Jan-21	Journal of Econometrics	The study looks at the effect of NPIs on growth rates but does include an estimate of the effect on total mortality at the end of the study period for employee face masks (-34%), business closure (-29%). and SIPO (-18%), but not for school closures (which we therefore exclude). In reporting the results of their counterfactual, they alter between "fewer deaths with NPI" and "more deaths without NPI." We have converted the latter to the former as estimate/(1+estimate) so "without business closures deaths would be about 40% higher" corresponds to "with business closures deaths would be about 29% lower."
Chisadza et al. (2021); "Government Effectiveness and the COVID-19 Pandemic"	10-Mar-21	MDPI	The common estimate is the average effect in Europe and United States respectively calculated as (Actual COVID-19 mortality) / (COVID-19 mortality with recommendation policy) -1, where (COVID-19 mortality with recommendation policy) is calculated as ((Actual COVID-19 mortality) - Estimate x Difference in stringency x population). Stringencies in Europe and United States are equal to the average stringency from March 16th to April 15th 2020 (76 and 74 respectively) and the stringency for the policy based solely on recommendations is 44 following Hale et al. (2020). In the meta-analysis we use the non-linear estimate, but the squared estimate yields similar results.
Dave et al. (2021); "When Do Shelter-in-Place Orders	3-Aug-20	Economic Inquiry	The study looks at the effect of SIPO's on growth rates but does include an estimate of the effect on total mortality after 20+ days for model 1 and 2 in Table 7. Since model 3, 4 and 5 have estimates

1. Study (Author & title)	2. Date Published	3. Journal	4. Comments regarding meta-analysis
Fight Covid-19 Best? Policy Heterogeneity Across States and Adoption Time"			similar to model 2, we use an average of model 1 to 5, where the estimates of model 3 to 5 are calculated as (common estimate model 2) / (estimate model 2) x estimate model 3/4/5.
Dergiades et al. (2020); "Effectiveness of government policies in response to the COVID-19 outbreak"	28-Aug-20	SSRN	The study is not included in the meta-analysis, as it looks at the effect of NPIs on growth rates and does not include an estimate of the effect on total mortality.
Fakir and Bharati (2021); "Pandemic catch-22: The role of mobility restrictions and institutional inequalities in halting the spread of COVID-19"	28-Jun-21	PLOS ONE	The study is not included in the meta-analysis, as it looks at the effect of NPIs on growth rates and does not include an estimate of the effect on total mortality.
Fowler et al. (2021); "Stay-at-home orders associate with subsequent decreases in COVID-19 cases and fatalities in the United States"	10-Jun-21	PLOS ONE	The study looks at the effect of SIPO's on growth rates but does include an estimate of the effect on total mortality after three weeks (35% reduction in deaths) which is used in the meta-analysis.
Fuller et al. (2021); "Mitigation Policies and COVID-19–Associated Mortality — 37 European Countries, January 23–June 30, 2020"	15-Jan-21	Morbidity and Mortality Weekly Report	For each 1-unit increase in OxCGRT stringency index, the cumulative mortality decreases by 0.55 deaths per 100,000. The common estimate is the average effect in Europe and United States respectively calculated as (Actual COVID-19 mortality) / (COVID-19 mortality with recommendation policy) -1, where (COVID-19 mortality with recommendation policy) is calculated as ((Actual COVID-19 mortality) - Estimate x Difference in stringency x population). Stringencies in Europe and United States are equal to the average stringency from March 16th to April 15th 2020 (76 and 74 respectively) and the stringency for the policy based solely on recommendations is 44 following Hale et al. (2020).
Gibson (2020); "Government mandated lockdowns do not reduce Covid-19 deaths: implications for evaluating the stringent New Zealand response"	18-Aug-20	New Zealand Economic Papers	We use the two graphs to the left in figure 3, where we extract the data from the rightmost datapoint (I.e. % impact of county lockdowns on Covid-19 deaths by 1/06/2020). We then take the average of the estimates found in the two graphs, because it is unclear which estimate the author prefers.
Goldstein et al. (2021); "Lockdown Fatigue: The Diminishing Effects of Quarantines on the Spread of COVID-19 "	4-Feb-21	CID Faculty Working	We convert the effect in Figure 4 after 90 days (log difference -1.16 of a standard deviation change) to deaths per million per stringency following footnote 3 (the footnote says "weekly deaths," but we believe this should be "daily deaths"), so the effect is e^-1.16 − 1 = −0.69 decline in daily deaths per million per SD. We convert to total effect by multiplying with 90 days and "per point" by dividing with SD = 22.3 (corresponding to the SD for the 147 countries with data before March 19, 2020 - using all data yields similar results) yielding -2.77 deaths per million per stringency point. The common estimate is the average effect in Europe and United States respectively calculated as (Actual COVID-19 mortality) / (COVID-19 mortality with recommendation policy) -1, where (COVID-19 mortality with recommendation policy) is calculated as ((Actual COVID-19 mortality) - Estimate x Difference in stringency x population). Stringencies in Europe and United States are equal to the average stringency from March 16th to April 15th 2020 (76 and 74 respectively) and the stringency for the policy based solely on recommendations is 44 following Hale et al. (2020).
Guo et al. (2021); "Mitigation Interventions in the United States: An Exploratory Investigation of Determinants and Impacts"	21-Sep-20	Research on Social Work Practice	We use estimates for "Proportion of Cumulative Deaths Over the Population" (per 10,000) in Table 3. We interpret this number as the change in cumulative deaths over the population in percent and is therefore the same as our common estimate.
Hale et al. (2020); "Global assessment of the relationship between government response measures and COVID-19 deaths"	6-Jul-20	medRxiv	The study is not included in the meta-analysis, as it looks at the effect of NPIs on growth rates and does not include an estimate of the effect on total mortality. They ascertain that "sustained over three months, this would correspond to a cumulative number of deaths 30% lower," however this is not a counterfactual estimate and three months goes beyond the period they have data for.
Hunter et al. (2021); "Impact of non-pharmaceutical interventions against COVID-19 in Europe: A quasi-experimental non-equivalent group and time-series"	15-Jul-21	Eurosurveillance	The study is not included in the meta-analysis, as they report the effect of NPIs in incident risk ratio which are not easily converted to relative effects.

1. Study (Author & title)	2. Date Published	3. Journal	4. Comments regarding meta-analysis
Langeland et al. (2021); "The Effect of State Level COVID-19 Stay-at-Home Orders on Death Rates"	5-Mar-21	Culture & Crisis Conference	The study is not included in the meta-analysis, as it looks at the effect of NPIs on odds-ratios and does not include an estimate of the effect on total mortality.
Leffler et al. (2020); "Association of country-wide coronavirus mortality with demographics, testing, lockdowns, and public wearing of masks"	26-Oct-20	ASTMH	Their "mask recommendation" includes some countries, where masks were mandated and may (partially) capture the effect of mask mandates. However, the authors' focus is on recommendation, so we do interpret their result as a voluntary effect - not an effect of mask mandate. Using estimates from Table 2 and assuming NPIs were implemented March 15 (8 weeks in total by end of study period), common estimates are calculated as 8^est-1.
Mccafferty and Ashley (2021); "Covid-19 Social Distancing Interventions by Statutory Mandate and Their Observational Correlation to Mortality in the United States and Europe"	27-Apr-21	Pragmatic and Observational Research	The study is not included in the meta-analysis, as it looks at the effect of NPIs on peak mortality and does not include an estimate of the effect on total mortality.
Pan et al. (2020); "Covid-19: Effectiveness of non-pharmaceutical interventions in the united states before phased removal of social distancing protections varies by region"	20-Aug-20	medRxiv	The study is not included in the meta-analysis, as the cluster the NPIs (e.g. SIPO, mask mandata amd travel restricions are clustered in Level 4).
Pincombe et al. (2021); "The effectiveness of national-level containment and closure policies across income levels during the COVID-19 pandemic: an analysis of 113 countries"	4-May-21	Health Policy and Planning	Policy implementations were assigned according to the first day that a country received a policy stringency rating above 0 in the OxCGRT stay-at-home measure. As the value 1 is a recommendation "recommend not leaving house," we cannot distinguish recommendations from mandates, and, thus, the study is not included in the meta-analysis.
Sears et al. (2020); "Are we #stayinghome to Flatten the Curve?"	6-Aug-20	medRxiv	Find that SIPOs lower mortality by 29-35%. We use the average (32%) as our common estimate. Common standard errors are calculated based on estimates and standard errors from (Table 4) assuming they are linearly related to estimates.
Shiva and Molana (2021); "The Luxury of Lockdown"	9-Apr-21	The European Journal of Develepment Research	The estimate with 8 weeks lag is insignificant, and preferable given our empirical strategy. However, they use the 4-week lag when elaborating the model to differentiate between high- and low-income countries, so the 4-week lag estimate for rich countries is used in our meta-analysis. Common estimate is calculated as the average of the effect in Europe and United States, where the effect for each is calculated as (policy stringency - recommendation stringency) x estimate.
Spiegel and Tookes (2021); "Business restrictions and Covid-19 fatalities"	18-Jun-21	The Review of Financial Studies	We use weighted average of estimates for Table 4, 6, and 9. Since authors state that they place more weight on the findings in Table 9, Table 9 weights by 50% while Table 4 and 6 weights by 25%. We estimate the effect on total mortality from effect on growth rates based on authors calculation showing that estimates of -0.049 and -0.060 reduces new deaths by 12.5% 15.3% respectively. We use the same relative factor on other estimates.
Stockenhuber (2020); "Did We Respond Quickly Enough? How Policy-Implementation Speed in Response to COVID-19 Affects the Number of Fatal Cases in Europe"	10-Nov-20	World Medical & Health Policy	When calculating arithmetic average / median, the study is included as 0%, because estimates in Table 6 are insignificant and signs of estimates are mixed (higher strictness can cause both fewer and more deaths). We don't calculate common standard errors.
Stokes et al. (2020); "The relative effects of non-pharmaceutical interventions on early Covid-19 mortality: natural experiment in 130 countries"	6-Oct-20	medRxiv	We use estimates from regression on strictness alone (Right panel in Table "Regression results, policy strictness. Baseline is "policy not introduced within policy analysis period" in "Additional file"). We use the average of 24 and 38 days from model 5. There are 23 relevant estimates in total (they analyze all levels within the eight NPI measures in the OxCGRT stringency index). We calculate the effect of each NPI (e.g. closing schools) as the average effect in all of U.S./Europe. This is done by calculating the effect for each state/country based on the maximum level for each measure between Mar 16 and Apr 15 (e.g. if all schools in a state/country are required to close (school closing level 3) the relevant estimate for that state/level is -0.031 (average of -0.464 and 0.402). We assume all NPIs are effective for 54 days (from March 15 to June 1 minus 24 days to reach full effect). Standard errors are converted to common standard errors following the same process (this approach is unique for Stokes, as our general approach is not possible).

1. Study (Author & title)	2. Date Published	3. Journal	4. Comments regarding meta-analysis
Toya and Skidmore (2020); "A Cross-Country Analysis of the Determinants of Covid-19 Fatalities"	1-Apr-20	CESifo Working Papers	It is unclear how they define "lockdown." They write that "many countries [...] imposed lockdowns of varying degrees, some imposing mandatory nationwide lockdowns, restricting economic and social activity deemed to be non-essential," and since all European countries and all states in the U.S. imposed restrictions on economic (closing unessential businesses) and/or social (limiting large gatherings) activity, we interpret this as all European countries and all U.S. states had mandatory nationwide lockdowns. The effect of recommended lockdowns is set to zero in the meta-analysis, as only one country was in this lockdown category (i.e. too few observations, cf. eligibility criteria). The estimate for complete travel closure is -0.226 COVID-deaths per 100,000. Hence, if all of Europe imposed complete travel closure, the total effect would be -0.266 * 748 million (population) * 10 (100,000/1,000,000) equal to 1,690 averted COVID-19 deaths. However, according to OxCGRT-data European countries only had complete travel bans (Level 4: "Ban on all regions or total border closure") in 11% of the time between March 16 and April 15, 2020. So the total effect is 1,690 * 11% = 194 averted deaths. During the first wave 188,000 deaths in Europe was related to COVID-19 (by June 30, 2020), so the total effect is approximated to -0.1% in Europe and, following the same logic, 0% in U.S., where no states closed their borders completely. We use the average, -0.05%, in the meta-analysis. The estimate for mandatory national lockdown is 0.166 (>0) COVID-deaths per 100,000. Since all European countries (and U.S. states) imposed lockdowns, the total effect is 1,241 (553) extra COVID-19 deaths corresponding to 0.7% (0.4%). We use the average of Europe and the U.S., 0.5%, in the meta-analysis. Calculations of the effect of "Mandatory national lockdown" follow the same logic, but we assume 100% of Europe and United States have had "Mandatory national lockdown."
Tsai et al. (2021); "Coronavirus Disease 2019 (COVID-19) Transmission in the United States Before Versus After Relaxation of Statewide Social Distancing Measures"	3-Oct-20	Oxford academic	The study is not included in the meta-analysis, as they report the effect of NPIs on Rt which are not easily converted to relative effects.

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Sir/Madam

REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF NATIONAL STATE OF DISASTER

1. We act on instructions of Sakeliga NPC ("our client").

2. We refer to our letter of 12 January 2022, to which we have yet to receive a response. The other recipients of our earlier letter will also receive a copy of this letter.

3. We refer to your decision as Head of Centre of the National Disaster Management Centre ("the **NDMC**") on 15 March 2020 to classify 'COVID-19' as a national disaster in terms of section 23 of the Disaster Management Act 57 of 2002 ("**DMA**").

4. Our client requests that your offices kindly confirm whether your offices have made any reclassifications or reassessments of the aforementioned 'national disaster' since your initial decision. In particular, we request that you provide us with the relevant record regarding the classification and continued classification of 'COVID-19' as a 'national disaster'. We request that your offices provide us with:

   4.1 All assessments done during or about March 2020 regarding the magnitude or potential magnitude of 'COVID-19' as a 'national disaster' as defined by the DMA;

   4.2 All assessments conducted in March 2020 regarding the severity or potential severity of 'COVID-19' as a 'national disaster' as defined by the DMA;

   4.3 All assessments conducted after March 2020 regarding the actual magnitude of 'COVID-19' and its continued classification as a 'national disaster' in terms of the DMA;

   4.4 All assessments conducted after March 2020 regarding the actual severity of 'COVID-19' and its continued classification as a 'national disaster' in terms of the DMA;

   4.5 All records of such assessments and classifications recorded by your offices in terms section 23(1) of the DMA;

   4.6 All further information and recommendations concerning 'COVID-19' received from provincial and municipal disaster management centres in terms of sections 35 and 49 of the DMA between February 2020 up and until date of this letter;

   4.7 All correspondence between you, the NDMC and the Minister of Cooperative Governance and Traditional Affairs ("**COGTA**"), the National Minister of Health and/or the Presidency regarding the classification and/or continued classification and/or de-classification of 'COVID-19' as a 'disaster', 'national disaster', 'provincial disaster' or 'local disaster'.

5. Our client is concerned by the NDMC's lack of communication with the public regarding is the assessment of the 'national disaster'. Our client's position is that a national disaster, especially one that necessitates the continuing and material limitation of constitutional rights and freedoms, requires a continuing and thorough assessment of the actual state of a purported disaster. We are unaware of any reassessments of the severity and magnitude of 'COVID-19', or its classification as a 'national disaster' since 15 March 2020.

6. In our letter of 12 January 2022, our client already objected to Government persisting with the 'national state of disaster' under section 27(1) of the DMA. In spite of our letter, COGTA on 14 January 2022 extended the 'national state of disaster' to 15 February 2022.

7. Our client is concerned by the NDMC's lack of continuing reassessment of the magnitude and severity of 'COVID-19'. Our client's position is that the DMA was not designed to allow the national executive the right to indefinitely limit constitutional freedoms and regulate society via the executive decisions in the drastic and prolonged manner employed by COGTA to date. Furthermore, the DMA places a duty on you as the Head of Centre to continuously consider and assess 'disasters' facing the country. Section 23(7) of the DMA makes it abundantly clear that a disaster may only be deemed to be a 'provincial' or 'national' disaster if supported by classification as such by the NDMC. Failing a proper and objective classification of an event as an actual 'disaster', national intervention under section 27 is unlawful. Furthermore, classification as a 'national disaster' under section 23(7) is a prerequisite for a declaration or extension of a 'national state of disaster' under section 27(1).

8. Our client's position is that a 'state of disaster' cannot continue on the construction of the DMA if no objective 'disaster' exists or alternatively continues to exist.

9. The DMA requires the NDMC to give expert assistance to state organs in identifying, classifying, and managing actual disasters. Even though the Act gives some discretion to the NDMC as to when they should consider a reclassification, the DMA also places a statutory duty on the NDMC to continuously assess and consider the risks associated with not only future disasters but also currently classified and declared disasters. If the NDMC fails in its duties concerning continuous assessment, it will expose those organs of state with the primary responsibility of managing a disaster to governmental overreach and unlawful and unconstitutional conduct. In the specific case of 'COVID-19', the current disaster management regulations issued by COGTA under section 27(2), requires an actual and objective 'disaster' to exist before the said minister can invoke her powers under the DMA.

10. Our client's position is that the severity and magnitude of 'COVID-19' do not, alternatively no longer, warrant classification as a 'national disaster'. It is also our client's position that you, as the Head of Center of the NDMC, are required to reconsider and reclassify 'COVID-19', alternatively to provide us with the reasons for the continued classification of COVID-19' as a 'national disaster'.

11. As a result of the continued classification of 'COVID-19' as a 'national disaster', the 'national state of disaster' has remained in place for close to two years. Our client cannot allow a continued and unfettered extension of a purported 'national state of disaster' where the current facts clearly show that the magnitude and severity of 'COVID-19' is objectively lower than the initial assessments made by your offices; to such an extent that the facts no longer support invasive and drastic disaster management or the classification of 'COVID-19' as an objectively assessed 'disaster'.

12. Accordingly, our client requires that you and the NDMC reassess the classification of 'COVID-19' as a 'national disaster' and terminate the current classification by no later than 28 January 2022. If you fail and/or refuse to do so, our client will seek relief, which can include urgent relief against you. Such relief will include an order to compel you to conduct a reassessment under section 23 and/or a review of the relevant classifications at that stage.

13. Notwithstanding the wording of the DMA, our client submits that you have a constitutional duty to prevent the unnecessary curtailing of constitutional rights and freedoms. Furthermore, as a public office bearer, you have a positive duty to ensure and promote the protection of constitutional freedoms. This duty obligates you to continuously assess and reassess the classification of 'disasters', especially where the response by other organs of state results in severe and long-term limitation of constitutional freedoms.

14. Accordingly, if you fail to issue a reassessment of your classification of 'COVID-19' by the due date stated above, our client will also consider approaching the Courts for urgent relief in terms of section 172 of the Constitution.

15. We await your urgent response.

Yours faithfully,

KRIEK WASSENAAR & VENTER ING
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Adv. Peter Wassenaar
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Dear Adv. Wassenaar

REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF A NATIONAL STATE OF DISASTER

Your letter dated 12 January 2022 pertaining the matter above, bears reference.

As you are aware, the classification of a disaster is set out in section 23 of the Disaster Management Act, 2002 (Act No. 57 of 2002) and empowers me as the Head of the National Centre to classify local, provincial or national disasters when disastrous events occur or threaten to occur. It also empowers me to reclassify a disaster at any time, after consultation, if the magnitude or severity of the disaster is greater or lesser than the initial assessment.

In terms of this authority, I have classified the Covid-19 pandemic as a national disaster on 15 March 2020.

Subsequent to the Cabinet resolution of 15 March 2020, the Minister of Cooperative Governance and Traditional Affairs (COGTA), declared a national state of disaster in terms of Section 27(1) of the Disaster Management Act, 2002 having recognised that the special circumstances presented by the COVID-19 pandemic warranted the declaration of a national state of disaster.

REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF NATIONAL STATE OF DISASTER

Given this, the ongoing impact of the COVID-19 pandemic, and the Cabinet decision that the national state of disaster remains in place at least until 15 February 2022, I contend that the reclassification of the event to that of a provincial or local disaster is neither reasonable or rational. Similarly, the revocation of the classification cannot be reasonably or rationally justified outside the implementation of sustainable regulatory measures needed for the control of COVID-19 beyond the national state of disaster that is based on existing legislation administered by the respective Ministries.

On the basis of the above, I cannot accede to your client's demand that the NDMC reconsiders the classification of COVID-19 as a national disaster.

Yours Sincerely,

DR MMAPHAKA TAU
HEAD: NATIONAL DISASTER MANAGEMENT CENTRE
DATE: 20 JANUARY 2022

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Mr President / Minister / Sir / Madam

REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF NATIONAL STATE OF DISASTER

1. We act on instructions of Sakeliga NPC ("our client").

2. On 15 March 2020, the Head of Centre of the National Disaster Management Centre (the "**NDMC**") classified the spread of 'COVID-19' to be a 'national disaster'. After the classification and on 15 March 2020, the Minister of Cooperative Governance and Traditional Affairs ("**COGTA**") declared a 'national state of disaster' in terms of section 27(1) of the Disaster Management Act 57 of 2002 (the "**DMA**"). As on date of this letter, COGTA has extended the 'national state of disaster' consecutively for almost two years and will be required again to publish a notice of extension on 15 January 2022 if she intends to maintain the statutory 'state of disaster'. Since publishing the original classification of the 'national disaster' by the NDMC in March 2020, the Head of Centre has not published any further classifications on the matter.

3. Our client's position is that a recognisable 'disaster', alternatively one with exceptional circumstances that warrant a declaration of a 'national state of disaster', does not exist; alternatively, it no longer exists. Furthermore, it is our client's position that the magnitude and severity of COVID-19 – also recognising the country's ability to receive, hospitalise and treat severe cases, manage public health and safety and general public awareness regarding the

dangers and treatment of the COVID-19 - does not warrant, alternatively any longer warrants, classification as a 'national disaster'.

4. Section 27(1) DMA only empowers COGTA to maintain and declare a 'national state of disaster' if:

   4.1 existing legislation and contingency arrangements do not adequately provide for the national executive to deal effectively with the disaster; or

   4.2 special circumstances warrant the declaration of a national state of disaster.

5. Our client's position is that the current health and safety legislation adequately provides for the effective handling of COVID 19. The current regulations issued by COGTA under section 27(2) of the DMA merely limit constitutional freedoms with minimal, if any, impact on the spread of the virus, the increasing of government hospital capacity and the combating of loss of life. The regulations do not serve a reasonable governmental purpose.

6. Furthermore, a reasonable and necessary response under the DMA should minimise total harm to the public, and not only focus on specific, potential or future harm caused by a single identified or potential 'disaster' factor. It is our client's position that the damage caused by the restricting of constitutional rights and freedoms in response to a single public risk similar to the 'national disaster' as defined and classified by the NDMC and COGTA, outweighs the purported benefits that the response seemingly hopes to achieve. Our client believes that the following costs, to name but a few, severely outweigh the disaster management benefits of the current regulations:

   6.1 Reduced public service and service delivery;

   6.2 The devastation of massive portions of the economy;

   6.3 The devastation of arts, culture and sports sectors;

   6.4 The devastation of tourism, restaurant and hospitality industries;

   6.5 The devastation of charities and the non-profit sector;

   6.6 Reduced quality of education;

   6.7 Increases in unemployment;

6.8 Increases in government debt;

6.9 The increased tax burden on government spending on disaster management;

6.10 Burden on future taxation;

6.11 Burden on future pension retirement provision;

6.12 Increases in domestic violence;

6.13 Increases in the cost of doing business.

7. Our client demands that the NDMC and COGTA reconsider the classification of COVID-19 as a 'national disaster'. Our client also demands that COGTA terminate the 'national state of disaster', alternatively refuse to extend the 'national state of disaster' on 15 January 2022, and withdraw all regulations issued under section 27(2) of the DMA.

8. Our client is currently consulting with its legal team and various experts. Our client will consider further legal options, should there be a continuance of the 'national state of disaster', and the continued classification of COVID-19 as a 'national disaster'.

Yours faithfully,

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Our Ref: PJ Wassenaar/es/QB0926
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31 January 2022

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Mr President / Minister / Sir / Madam

REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF NATIONAL STATE OF DISASTER

1. We refer to our letter of 12 January 2022 as well as our letter addressed to the Head of Centre of the National Disaster Management Centre (the **'NDMC'**) dated 17 January 2022. A copy of the last-mentioned letter was also forwarded to the other recipients of this letter.

2. We have yet to receive a response from any of the recipient parties.

3. Due to the lack of communication from government, the extension of the national state of disaster to 15 February 2022 and the failure by the NDMC to respond to our demand that the classification of 'Covid-19' as a national disaster be withdrawn by 28 January 2022, our client is now forced to approach the High Court for relief.

4. Our client persists with its demand for the immediate termination of the national state of disaster. We have no choice but to take notice of your refusal to respond to our demands and to proceed with litigation in the public interest.

Yours faithfully,

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Reference: 17/7/3

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Pretoria
0184

Dear Adv. Wassenaar

RE: REVIEW OF CLASSIFICATION OF NATIONAL STATE OF DISASTER RELATING TO CORONAVIRUS COVID-19 PANDEMIC AND DECLARATION OF NATIONAL STATE OF DISASTER

Your letter dated 12 January 2022 in the above regard, bears reference

At the meeting of Cabinet held on 14 January 2022, it was resolved that the national state of disaster be extended to 15 February 2022 and the requisite Notice was published in the Gazette later the same day.

I would like to assure you that the National Coronavirus Command Council (NCCC) and the Cabinet during these meetings, carefully considered if the measures imposed by the disaster management regulations were still needed to deal with the COVID-19 pandemic prior to its decision to extend the national state of disaster.

It is also important to point out that relevant departments have embarked on a process to develop sustainable regulatory measures needed for the control of COVID-19 beyond the national state of disaster in terms of existing legislation administered by the respective Cabinet Members

A specific date by which the national state of disaster is to be lifted cannot therefore be provided at this stage but it is important to reiterate that all restrictions will be lifted and the national state of disaster will be terminated as soon as it is determined to

provide relief to the public, protecting property, preventing or combatting disruption or dealing with the destructive and other effects of the disaster.

This in effect means that I am not in a position to accede to your clients' demand to terminate the 'national state of disaster', or alternatively refuse to extend the 'national state of disaster', and withdraw all regulations issued under section 27(2) of the Disaster Management Act, 2002.

I am confident that the national state of disaster will be terminated as soon as adequate measures to deal with the effects of COVID-19 beyond the state of disaster have been finalised.

Yours Sincerely,

NC Zuma

DR NKOSAZANA DLAMINI ZUMA, MP
MINISTER
DATE: 07.02.22