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MORNING BRIEF

Scientific Review

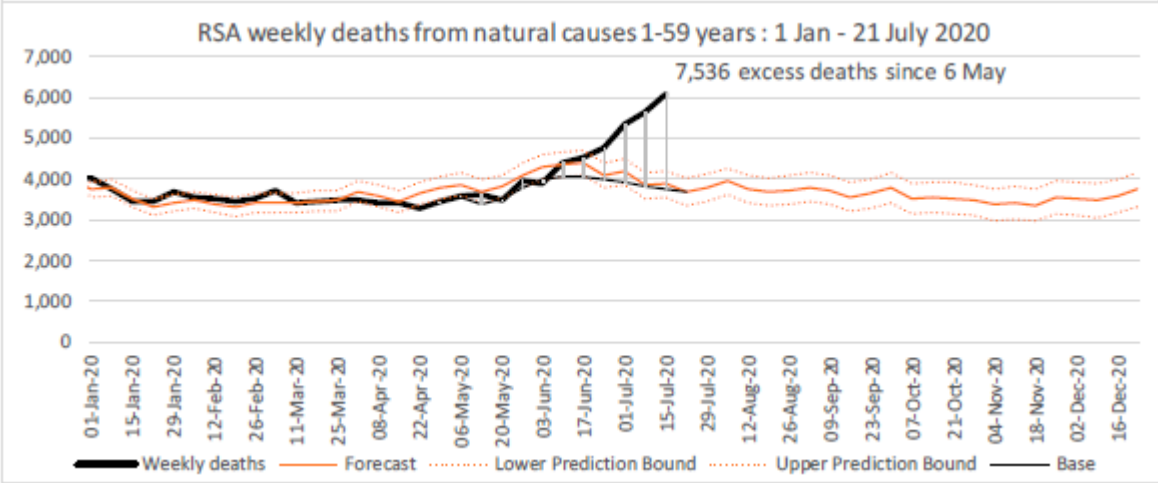
31 July 2020

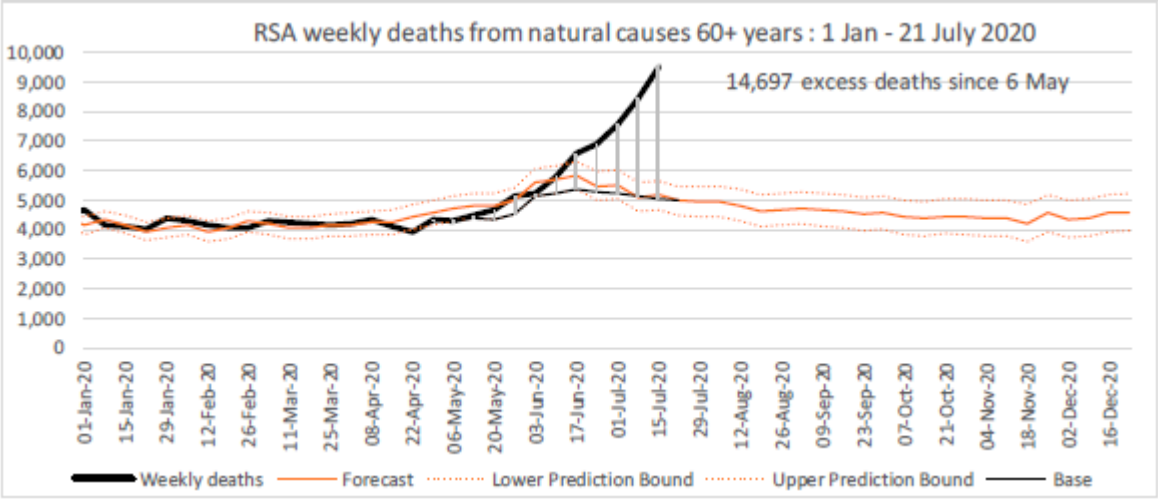
The purpose of the Morning Brief is to summarize and present key information, research articles and other relevant publications pertaining to critical care and COVID-19.

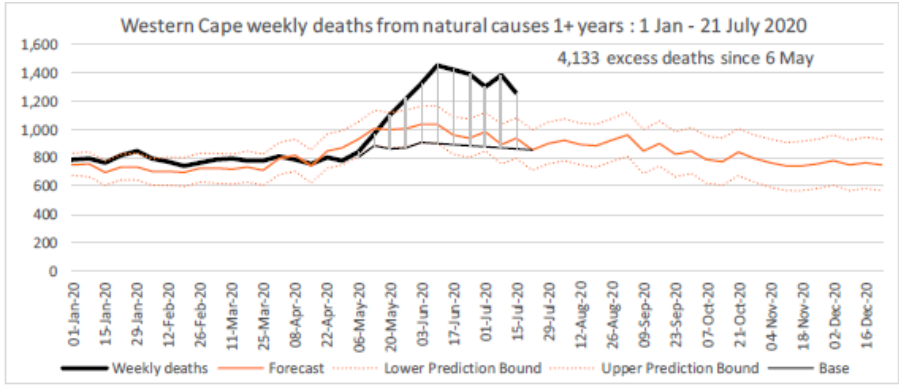
Stellenbosch University Research Response Team

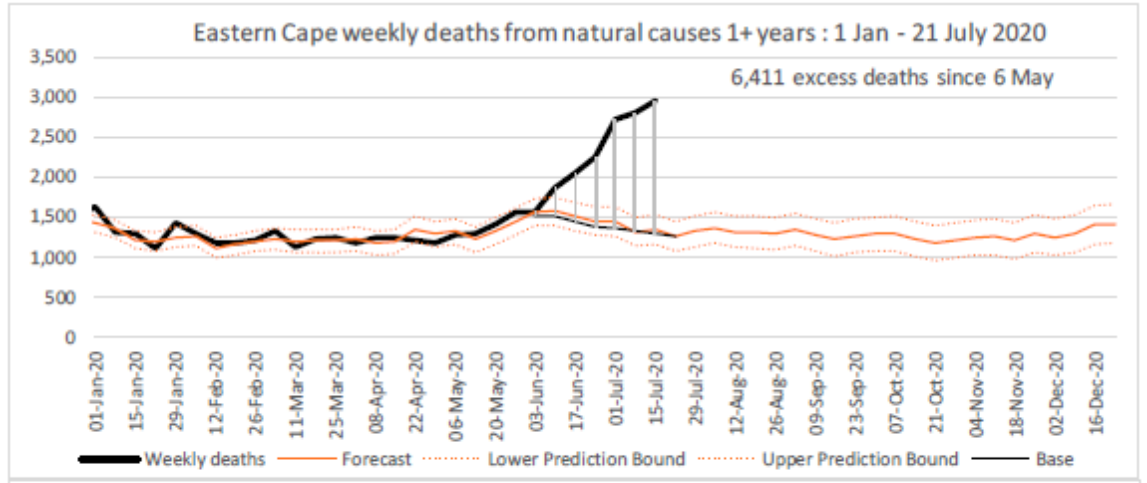
Content

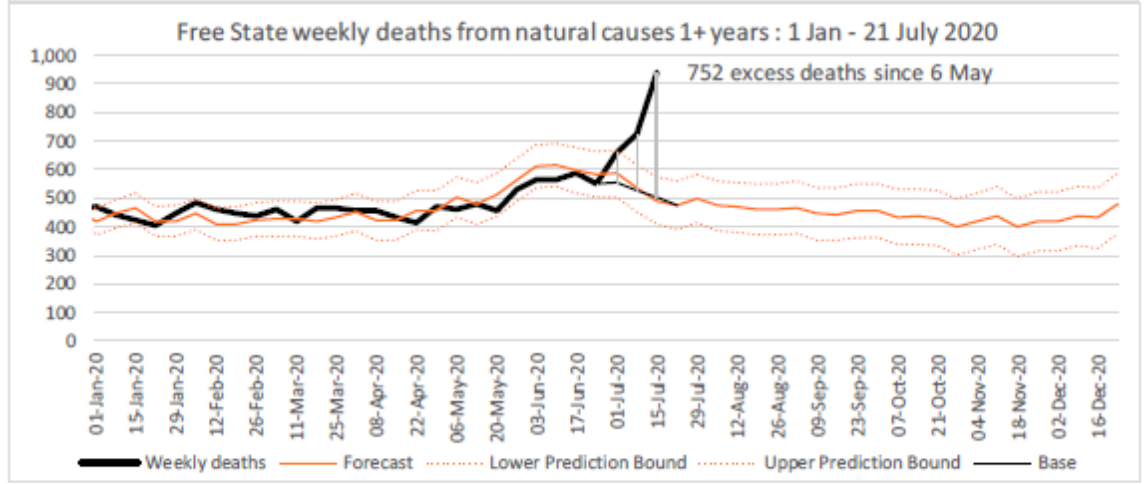
MRC Weekly Mortality report
Predictive models for diagnosis / prognosis

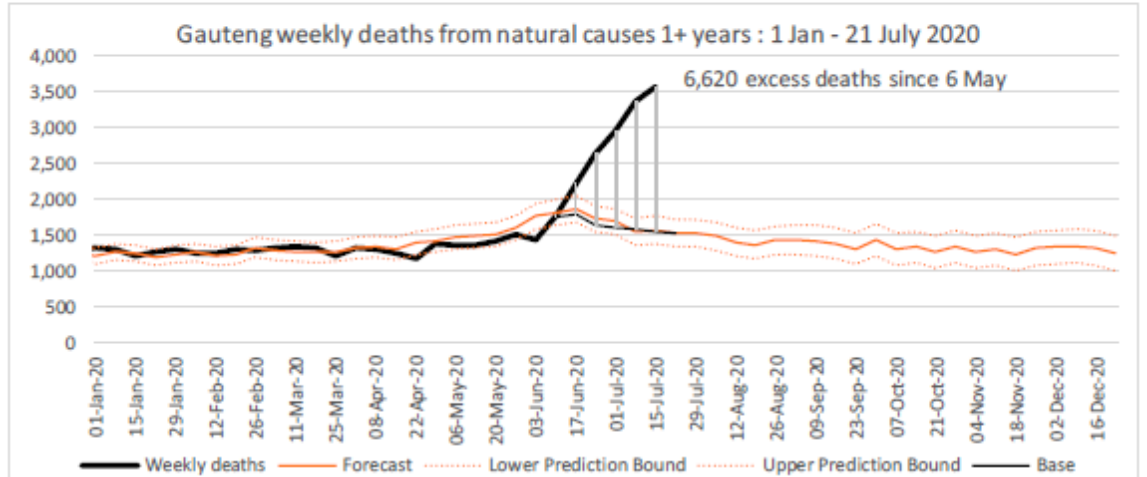

RSA weekly deaths from natural causes 1-59 years : 1 Jan - 21 July 2020
7,536 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

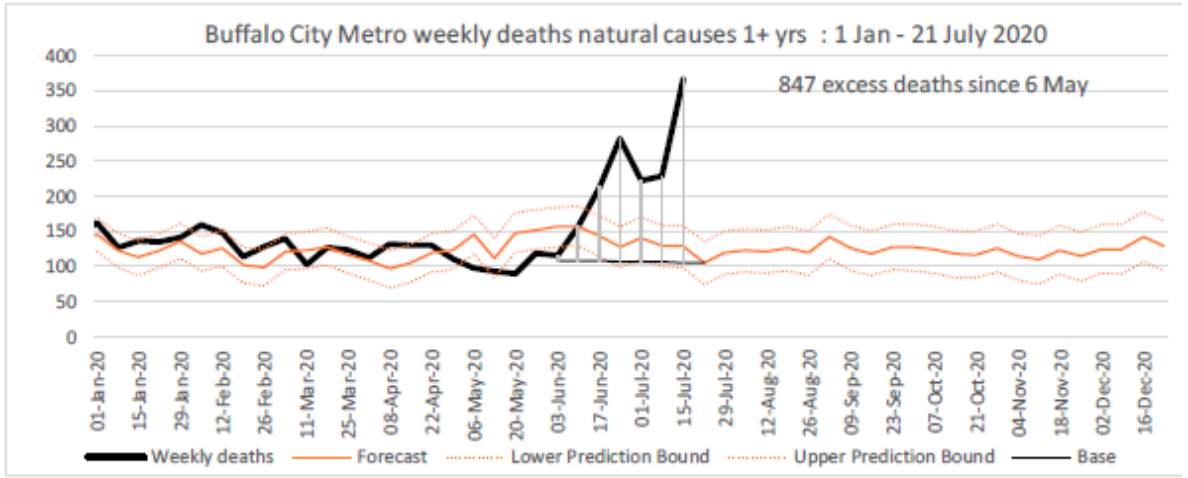

RSA weekly deaths from natural causes 60+ years : 1 Jan - 21 July 2020
14,697 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

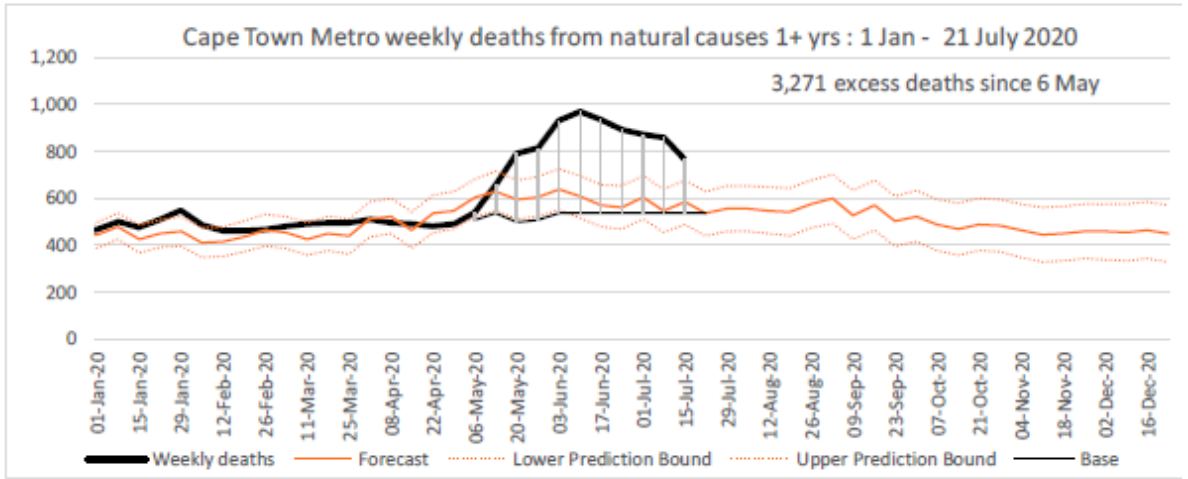

Western Cape weekly deaths from natural causes 1+ years : 1 Jan - 21 July 2020
4,133 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

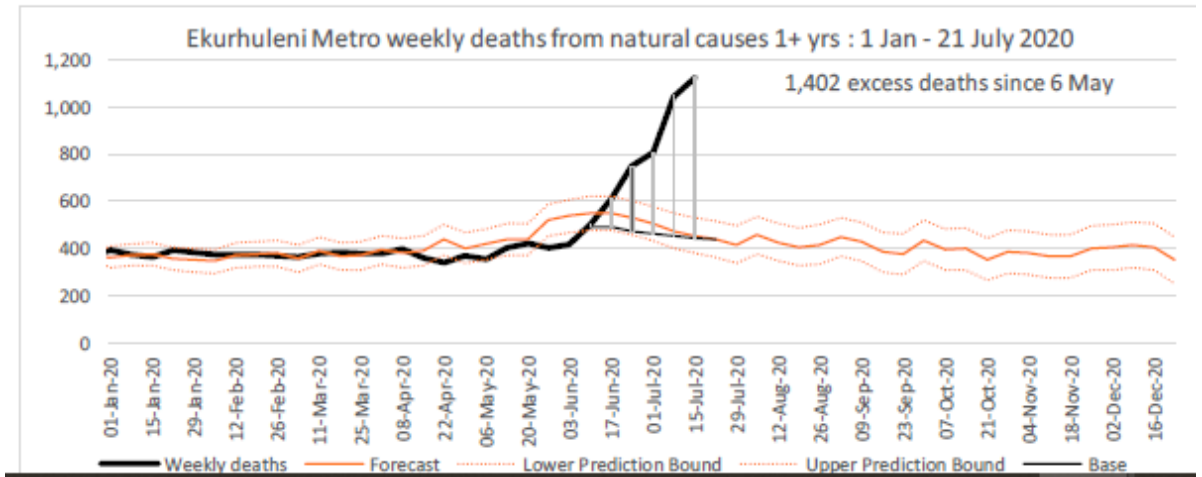

Eastern Cape weekly deaths from natural causes 1+ years : 1 Jan - 21 July 2020
6,411 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

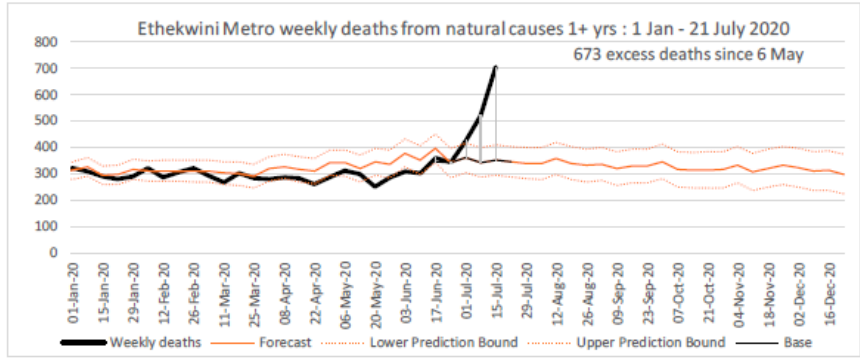

Free State weekly deaths from natural causes 1+ years : 1 Jan - 21 July 2020
752 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

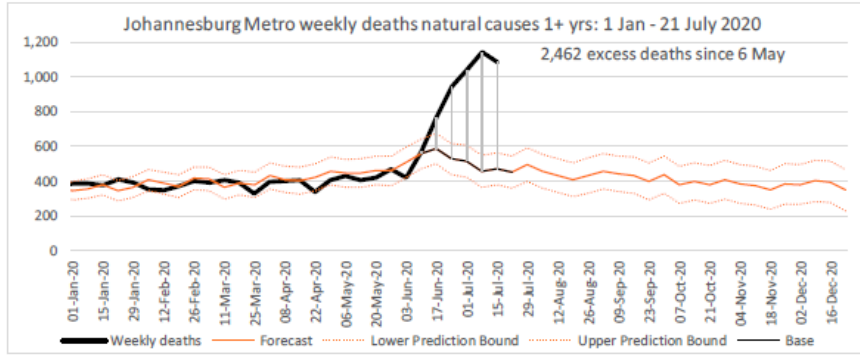

Gauteng weekly deaths from natural causes 1+ years : 1 Jan - 21 July 2020
6,620 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

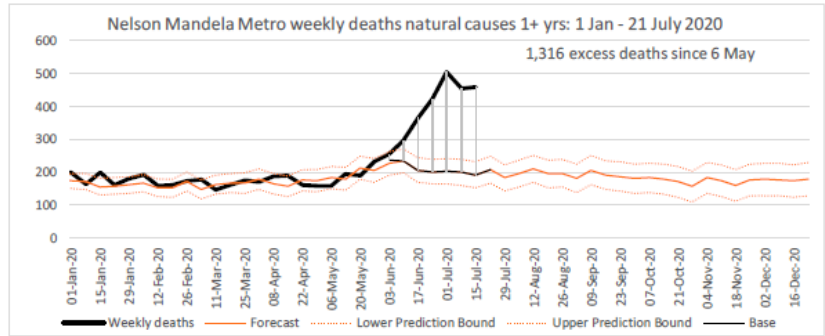

Buffalo City Metro weekly deaths natural causes 1+ yrs : 1 Jan - 21 July 2020
847 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

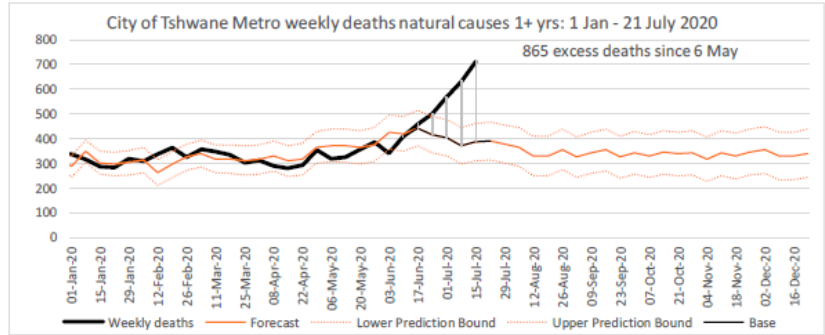

Cape Town Metro weekly deaths from natural causes 1+ yrs : 1 Jan - 21 July 2020
3,271 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base


Ekurhuleni Metro weekly deaths from natural causes 1+ yrs : 1 Jan - 21 July 2020
1,402 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base


Ethekwini Metro weekly deaths from natural causes 1+ yrs : 1 Jan - 21 July 2020
673 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base


Johannesburg Metro weekly deaths natural causes 1+ yrs: 1 Jan - 21 July 2020
2,462 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base


Nelson Mandela Metro weekly deaths natural causes 1+ yrs: 1 Jan - 21 July 2020
1,316 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base


City of Tshwane Metro weekly deaths natural causes 1+ yrs: 1 Jan - 21 July 2020
865 excess deaths since 6 May
Weekly deaths
Forecast
Lower Prediction Bound
Upper Prediction Bound
Base

Living systematic review of published predictive models to predict:

- Risk for Covid-19
- Risk for hospital admission
- Presence of SARS-CoV-2 in patients with suspected infection
- Prognosis

Peer reviewed and non-peer reviewed included, up to 5 May 2020

Included studies that

- developed or validated a multivariable model
- or scoring system,
- based on individual participant level data,
- to predict any covid-19 related outcome

Three types identified

- Diagnostic models in suspected cases
- Prognostic models
- Identifying people with increased risk of infection in general population

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Research

Prediction models for diagnosis and prognosis of covid-19: systematic review and critical appraisal

BMJ 2020 ; 369 doi: https://doi.org/10.1136/bmj.m1328 (Published 07 April 2020)
Cite this as: *BMJ* 2020;369:m1328

Laure Wynants, assistant professor[1 2], *Ben Van Calster*, associate professor[2 3], *Gary S Collins*, professor[4 5], *Richard D Riley*, professor[6], *Georg Heinze*, associate professor[7], *Ewoud Schuit*, assistant professor[8 9], *Marc M J Bonten*, professor[8 10], *Darren L Dahly*, principal statistician[11 12], *Johanna A A Damen*, assistant professor[8 9], *Thomas P A Debray*, assistant professor[8 9], *Valentijn M T de Jong*, assistant professor[8 9], *Maarten De Vos*, associate professor[2 13], *Paula Dhiman*, research fellow[4 5], *Maria C Haller*, medical doctor[7 14], *Michael O Harhay*, assistant professor[15 16], *Liesbet Henckaerts*, assistant professor[17 18], *Pauline Heus*, doctoral candidate[8 9], *Nina Kreuzberger*, research associate[19], *Anna Lohmann*, researcher in training[20], *Kim Luijken*, doctoral candidate[20], *Jie Ma*, medical statistician[5], *Glen P Martin*, lecturer[21], *Constanza L Andaur Navarro*, doctoral student[8 9], *Johannes B Reitsma*, associate professor[8 9], *Jamie C Sergeant*, senior lecturer[22 23], *Chunhu Shi*, research associate[24], *Nicole Skoetz*, medical doctor[19], *Luc J M Smits*, professor[1], *Kym I E Snell*, lecturer[6], *Matthew Sperrin*, senior lecturer[25], *René Spijker*, information specialist[8 9 26], *Ewout W Steyerberg*, professor[3], *Toshihiko Takada*, assistant professor[8], *Ioanna Tzoulaki*, assistant professor[27 28], *Sander M J van Kuijk*, research fellow[29], *Florien S van Royen*, research fellow[8], *Jan Y Verbakel*, assistant professor[30 31], *Christine Wallisch*, research fellow[7 32 33], *Jack Wilkinson*, research fellow[22], *Robert Wolff*, medical doctor[34], *Lotty Hooft*, associate professor[8 9], *Karel G M Moons*, professor[8 9], *Maarten van Smeden*, assistant professor[8]

Results

14209 titles screened with artificial intelligence

275 selected for abstract and full text review

107 studies describing 145 prediction models included

Countries:

- 45 data from China
- 6 Italy
- Others – Brazil, US, France, South Korea, Belgium, Netherlands, UK, Israel, Mexico, Singapore
- 22 international
- 2 simulated data

59 studies reported study dates – 8 December to 21 April spanned

Included participants

- Median age 34 to 68
- Proportion men 35% to 75%

Models that predicted death

- percentage deaths 1-59%

Only 9 reported on prevalence of Covid-19 and used cross-sectional or cohort design

58 case-control or unclear design

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Results

Risk of Covid-19 in general population

4 models, 3 of them had no covid-19 patients in the study, 1 detected abnormal breathing, not Covid-19

Diagnosis of Covid-19

22 models

Accuracies 0.65 to 0.99

Most frequent predictors

Flu-like symtpoms, imaging e.g. CT, age, body temp, lymphocyte count, neutrophil count

Predicting severe disease

9 studies, accuracies 0.8 to 0.99

Frequent predictors

Comorbidities, liver enzymes, CRP, imaging features, neutrophil count

Diagnosis based on images

60 models, CT or CXR

Some spectrograms of cough sounds, lung ultrasound

Accuracies 0.81 to 0.99

Prognostic models

50 models

Intended use often not clearly defined

Time intervals often not specified

23 models estimated mortality risk, accuracies 0.68 to 0.98

8 predicted progression to severe disease, accuracies 0.73 to 0.99

Others – hospital stay, ICU admission, intubation, ventilation etc.

Frequent predictors

Comorbidities, age, sex, lymphocyte count, CRP, body temp, creatinine and imaging features

All models with external validation attempts, performed poorly in validation

All studies high risk of bias

Participants not representative

Unclear reporting on patient characteristics

Small sample sizes, no validation

25 models validated on independent data, but in half the validation cohort was not representative

Conclusion
None of the 145 models can be recommended for clinical practice

Recommend validating promising ones, not developing new ones

Examples included predicitors:
Co-morbidities, age, CRP, D-dimer, LDH,

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This summary was prepared by Dr E Maasdorp as part of the daily brief to the TBH ICU team.