Females in hospital with SARS-CoV-2 infection, the association with pregnancy and pregnancy outcomes A UKOSS/ISARIC/CO-CIN investigation

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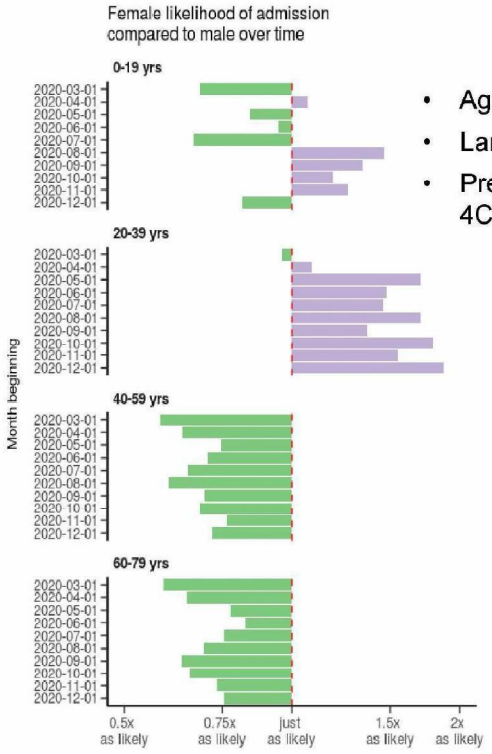
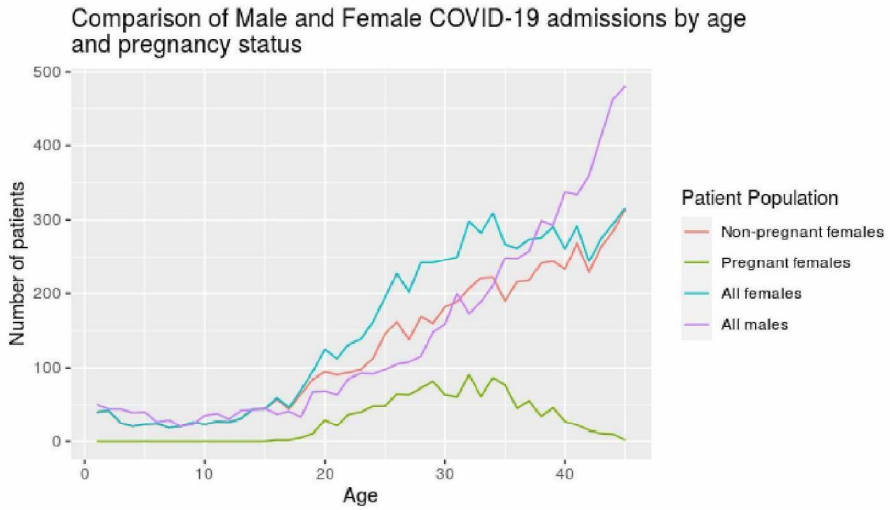
Female admissions

- Aged 20-39 more females than males were admitted
- Largely but not entirely be explained by the admissions of pregnant women
- Pregnant women admitted have a shorter length of stay than non-pregnant and lower 4C mortality scores than non-pregnant women





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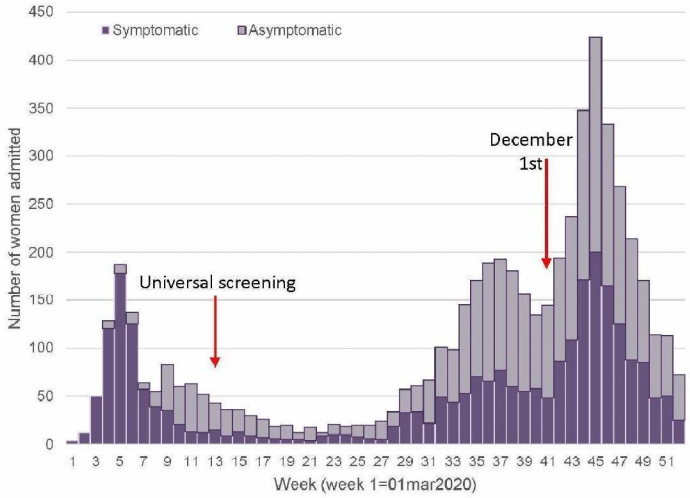
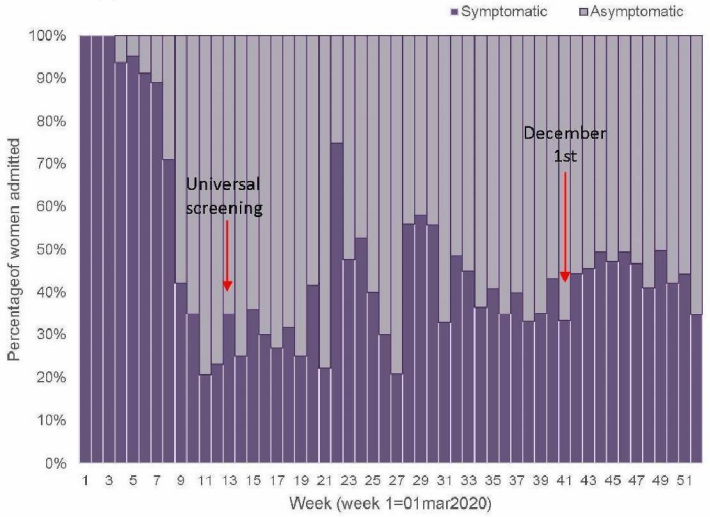
UK admissions of pregnant women and symptoms

- Overall 48% of pregnant women admitted were symptomatic
- The proportion of pregnant women admitted who were symptomatic varied over time:
  35% Jun-Aug 2020, 40% Sep-Nov 2020, 46% Dec 2020-Feb 2021, p<0.001 for trend over time June 2020-Feb 2021



Pregnant women admitted with confirmed SARS-CoV-2 infection
UK-wide 01/03/20-28/02/21



Proportion of admissions according to symptomatology

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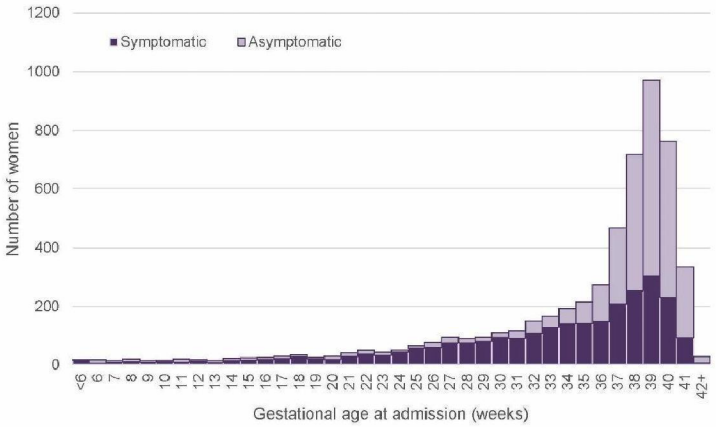
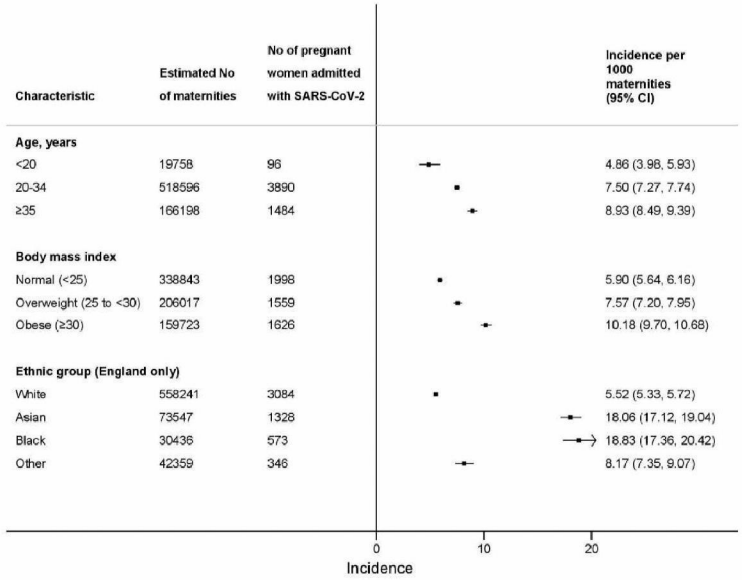
Characteristics of admitted pregnant women

- Median (IQR) gestation at admission for symptomatic pregnant women 35 weeks (29-38) and for asymptomatic pregnant women 39 weeks (37-40).
- Older women, Black, Asian or other minority ethnic group, obesity and co-morbidities including hypertension, diabetes and asthma associated with admission
- Only 42% of symptomatic women were admitted for the primary indication of covid-symptoms

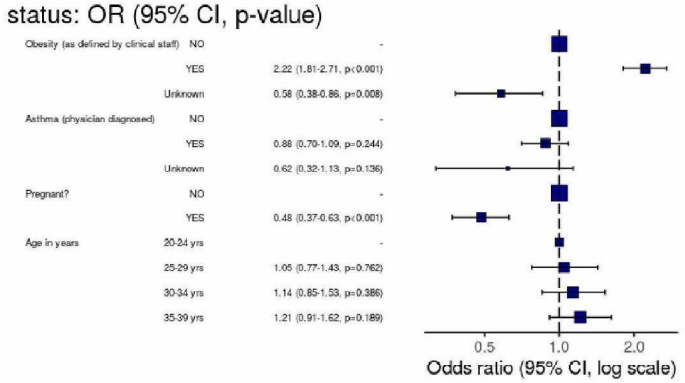


Characteristic	Estimated No of maternities	No of pregnant women admitted with SARS-CoV-2	Incidence per 1000 maternities (95% CI)
Age, years			
<20	19758	96	4.86 (3.98, 5.93)
20-34	518596	3890	7.50 (7.27, 7.74)
≥35	166198	1484	8.93 (8.49, 9.39)
Body mass index			
Normal (<25)	338843	1998	5.90 (5.64, 6.16)
Overweight (25 to <30)	206017	1559	7.57 (7.20, 7.95)
Obese (≥30)	159723	1626	10.18 (9.70, 10.68)
Ethnic group (England only)			
White	558241	3084	5.52 (5.33, 5.72)
Asian	73547	1328	18.06 (17.12, 19.04)
Black	30436	573	18.83 (17.36, 20.42)
Other	42359	346	8.17 (7.35, 9.07)



Women's outcomes

- In absolute terms pregnant women admitted to hospital with symptomatic COVID-19 were not at greater risk of adverse outcome, in part because of the lower threshold for admission
- 18% of symptomatic pregnant women required respiratory support, 10% received critical care and 0.6% died



Odds ratio plot of the likelihood of an unfavourable outcome following admission to hospital with COVID-19 for symptomatic women aged 20-39 years

	Symptomatic pregnant women (n=2,642) N (%)
Oxygen saturation measured on admission	2,392 (90.5)
Oxygen saturation <95%	190 (13.5)
Oxygen saturation ≥95%	1,223 (86.5)
Missing	979
Evidence of pneumonia on imaging	612 (23.2)
Required respiratory support	475 (18.0)
Non-invasive oxygen (nasal canulae, mask or non-rebreathe mask)	339 (12.8)
CPAP	44 (1.7)
Invasive ventilation or ECMO	71 (2.7)
Required support but level not known	21 (0.8)
Critical care received	250 (9.5)
Maternal death	15 (0.6)

Respiratory characteristics and support needs of symptomatic pregnant women admitted to hospital with confirmed SARS-CoV-2

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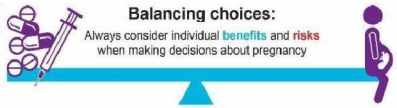
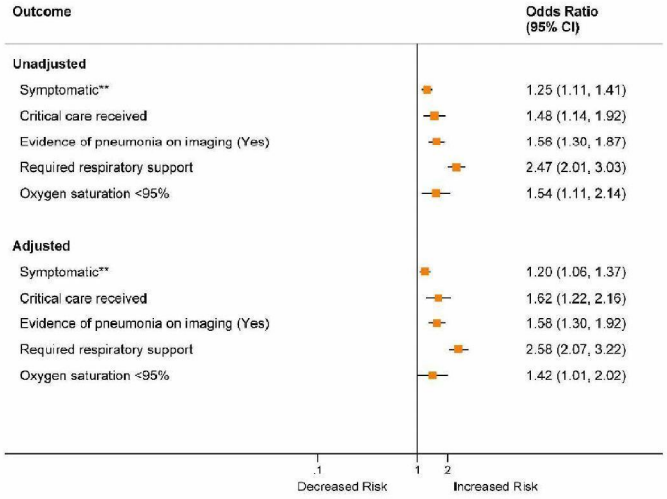
Symptoms/respiratory support needs and other treatments in pregnant women



Selected respiratory characteristics and outcomes in symptomatic pregnant women admitted to hospital with confirmed SARS-CoV-2 Dec 2020-Feb 2021 compared to Mar-Nov 2020



Note: **Odds ratios for symptomatic versus asymptomatic calculated for June 2020-February 2021 when screening was in place
Adjusted for age, ethnicity, BMI, and selected pre-existing conditions (asthma, hypertension, cardiac disease, and diabetes)

- Pregnant women admitted during the period when the B117 variant became predominant were significantly more likely to be symptomatic
- Symptomatic pregnant women admitted during the period when the B117 variant became predominant were significantly more likely to require respiratory support
- Covid-specific medical therapies were used infrequently, even for women who were critically ill
- Steroids for maternal indication administered to:
  - 7% of symptomatic pregnant women admitted
  - 18% of those who received critical care.
- 3% of symptomatic pregnant women admitted to hospital were recruited to the RECOVERY trial.
- After release of results on dexamethasone from the RECOVERY trial, rates of usage of steroids for maternal indications remained low:
  - 9% of women overall,
  - 23% of those receiving critical care

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Pregnancy and infant outcomes

- 21% of symptomatic women gave birth preterm compared to 10% of asymptomatic women
- 18% of symptomatic women admitted Mar-Nov 2020 gave birth preterm
- 20.9% (17.5%) of infants were admitted to a neonatal unit
- Very few neonates had confirmed postnatal infection

Pregnancy outcomes	Symptomatic women (n=2,642) N (%)	Symptomatic women admitted Mar-Nov 20 (n=1,437) N (%)	Asymptomatic women (n=2,837) N (%)
Birth	1926 (72.4)	1260 (87.5)	2531 (91.4)
Ongoing pregnancy	663 (25.1)	148 (10.3)	239 (8.4)
Pregnancy loss	53 (2.1)	29 (2.0)	67 (2.4)
Gestation at end of pregnancy (weeks)			
<22	43 (2.2)	25 (1.9)	46 (1.8)
22-36	419 (21.2)	237 (18.4)	262 (10.1)
37 or more	1501 (76.5)	1,018 (79.5)	2262 (88.0)
Missing	16	9	28

Infant outcomes	Infants of symptomatic mothers (n=1963) N (%)	Infants of symptomatic women admitted Mar-Nov 20 (n=1,286) N (%)	Infants of asymptomatic mothers (n=2566) N (%)
Stillbirth	24 (1.2)	14 (1.1)	20 (0.8)
Live birth[a]	1939 (98.8)	1272 (98.9)	2546 (99.2)
Neonatal death	4 (0.5)	1 (0.1)	5 (0.2)
Neonatal unit admission	405 (20.9)	223 (17.5)	239 (9.4)
Positive SARS-CoV-2 test <12 hrs of age	15 (0.8)	11 (0.9)	8 (0.3)

[a]Two infants' status at birth unknown

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

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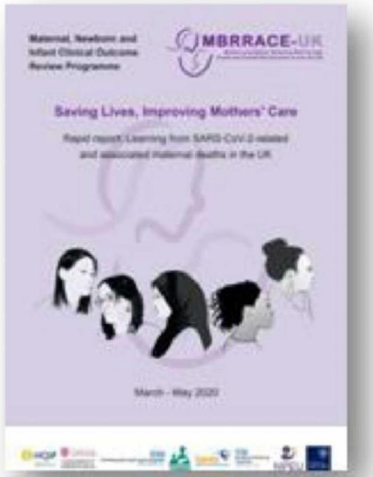
Indirect and long-term effects



- Maternal mortality rates have increased during the pandemic, but not solely due to covid-19.
- On the basis of deaths already notified, the UK maternal mortality rate for March 2020-February 2021 is likely to be at least 20% higher than in previous recent years (12 per 100,000 maternities compared to 10 per 100,000)
- More cases with concerns over care have been escalated in the past year compared to the total escalated in the previous ten years
  - Includes three deaths at home in women in late pregnancy who had not booked for antenatal care. At least two of these women's deaths were indirectly related to the pandemic
- Delays in units notifying stillbirths and neonatal deaths and time lags in receipt of data from ONS to allow for cross-checking are such that we cannot yet make any confident interpretation of stillbirth and neonatal mortality rates for 2020
- We have no data on long-term direct or indirect effects of covid-19 for pregnant women or their children
- Lack of research on vaccines in pregnancy means that most pregnant women are likely to remain unvaccinated (and hence vulnerable) when all other adults (and children) have been offered vaccination

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Summary

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- The apparent excess of hospitalisations in women of reproductive age with covid-19 compared to men is likely to be largely due to admission screening of women admitted for labour and birth and other pregnancy-related complications.
- Of symptomatic pregnant women hospitalised with covid-19, 10% received critical care and 1% died. 18% had a preterm birth, about 2.5 times the background rate.
- Symptomatic pregnant women received treatments for covid-19 late or not at all. Recruitment to therapeutic clinical trials remains low.
- Pregnant women hospitalised in areas/periods since the B117 variant became predominant were more likely to require respiratory support.
- Indirect effects are also evident, with maternal deaths due to women delaying attendance at hospital or concealing pregnancy.
- We have no evidence on the long-term effects of covid-19 in pregnancy for either women or their children.
- It would be useful to have systematic evidence on vaccination and pregnancy collected and analysed and when it exists from clinical trials for this to be presented at the earliest opportunity.