

Covid-19 India: State-level Estimates of Hospitalization Needs

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*Our COVID-19 estimates for India were produced by a team of researchers affiliated with CDDEP and Princeton. As with all academic work, this does not reflect the views of CDDEP or Princeton University.

Overview

Purpose: The purpose of this analysis was to determine hospitalization needs in each state for different assumed levels of infection of COVID-19. **At this time, given insufficient testing data, we have not been able to assess the impact of the lockdown on transmission.** We will be able to offer better guidance on the projected number of cases in coming days. Hospitalization needs projected here are conservative and do not reflect peak needs. Peak projections will be available once we are able to project the shape of the epidemic curve with further testing data.

Disclaimer: This analysis does not account for the impact of the nationwide lockdown issued on 25 March 2020. As with all responsive research, this work has not been peer-reviewed. If you find any errors, or have clarifications, please email us immediately at communications@cddep.org.

Assumptions

* *This analysis does not account for the impact of the nationwide lockdown issued on 25 March 2020.*

- **India's population age structure**
 - This was adapted from the NFHS4 2015-2016 [1]. The majority (92.1%) of India's population is in the age group 0-64 years.
- **COVID-19 infection rate**
 - We define the attack rate or incidence proportion for infection with SARS-CoV-2 as the number of new cases of infection during a specified time interval (e.g., the course of an epidemic) divided by the size of the population at the beginning of the epidemic.
 - We develop 3 possible scenarios assuming 0.5%, 1%, and 5% of the population is infected with COVID-19.
- **Proportion of COVID-19 patients who are asymptomatic/mild symptoms**
 - 16.39% of infections in age group 0-64 years are assumed to be asymptomatic or mildly symptomatic while only 9.86% of infections in >64 years are assumed to be asymptomatic or mildly symptomatic.
 - These values are estimated from Liu *et al.* (2020) [3], and reflect similar rates found in a study by Mizumoto *et al.* (2020) [4], which reported 320 asymptomatic cases out of a total of 634 COVID-19 positive cases during a two week quarantine period (5-20 February 2020) aboard the Diamond Princess cruise ship. Based on statistical modelling, the authors estimated a delay-adjusted asymptomatic rate of 17.9% for COVID-19 infections.
- **Proportion of COVID-19 patients who are symptomatic**
 - 83.61% of infections in age group 0-65 years are assumed to be symptomatic while 90.14% of infections in age group >65 years are assumed to be symptomatic. These values are estimated from Liu *et al.* (2020) [3] and exclude individuals who are mildly symptomatic.
- **Proportion of COVID-19 patients who require hospitalization**
 - We assume that COVID-19 patients who require hospitalization are those that are severely or critically ill, as defined by Liu *et al.* (2020) [3], and have estimated that 6.04% of infected cases in persons aged 0-64 years will require hospitalization while 28.17% of infected cases in persons 65 years and over will require hospitalization.

Assumptions (tabulated)

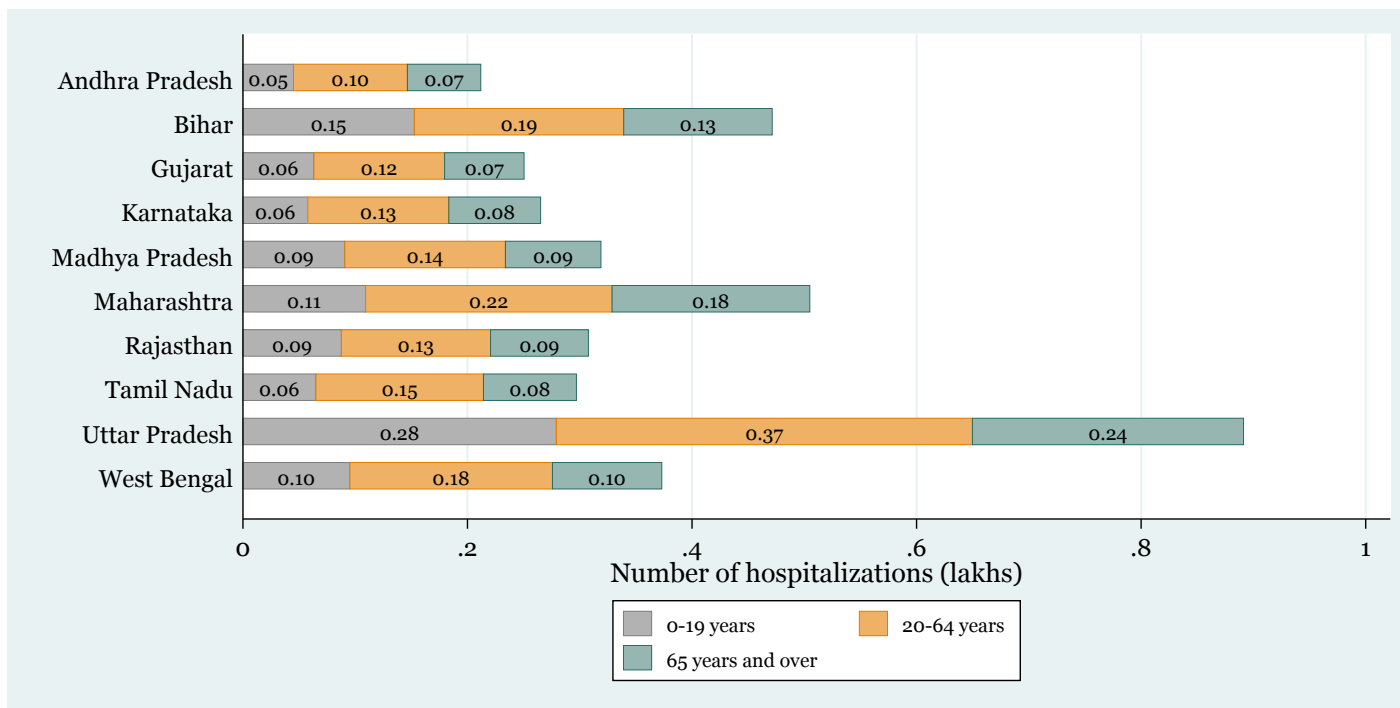
	Assumptions	Source												
India's population age structure	0-19 years: 34.2% 20-64 years: 57.9% >64 years: 7.9%	NFHS4 [1] and state-wise projected 2019 population [2]												
COVID-19 infection rate	3 possible scenarios: 0.5%, 1%, 5% of population	CDDEP's own assumption												
Proportion of COVID-19 patients who are asymptomatic/mild symptoms	0-19 years: 16.39% of infections in this age group are asymptomatic/mildly symptomatic 20-64 years: 16.39% of infections in this age group are asymptomatic/mildly symptomatic >64 years: 9.86% of infections in this age group are asymptomatic/mildly symptomatic	Liu <i>et al.</i> [3] Diamond Princess study [4] reported the following:												
		<table border="1"> <thead> <tr> <th>Age group</th> <th>COVID+ cases</th> <th>Asymptomatic cases during a two-week quarantine aboard ship</th> <th>Asymptomatic proportion estimated based on statistical modelling)</th> </tr> </thead> <tbody> <tr> <td>0-19</td> <td>6/634</td> <td rowspan="3">320/634</td> <td rowspan="3">17.9%</td> </tr> <tr> <td>20-59</td> <td>152/634</td> </tr> <tr> <td>60y+</td> <td>476/634</td> </tr> </tbody> </table>	Age group	COVID+ cases	Asymptomatic cases during a two-week quarantine aboard ship	Asymptomatic proportion estimated based on statistical modelling)	0-19	6/634	320/634	17.9%	20-59	152/634	60y+	476/634
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Proportion of COVID-19 patients who will require hospitalization	0-19 years: 6.04% of infections in this age group will require hospitalization 20-64 years: 6.04% of infections in this age group will require hospitalization >64 years: 28.17% of infections in this age group will require hospitalization	Liu <i>et al.</i> (2020) [3]												

References

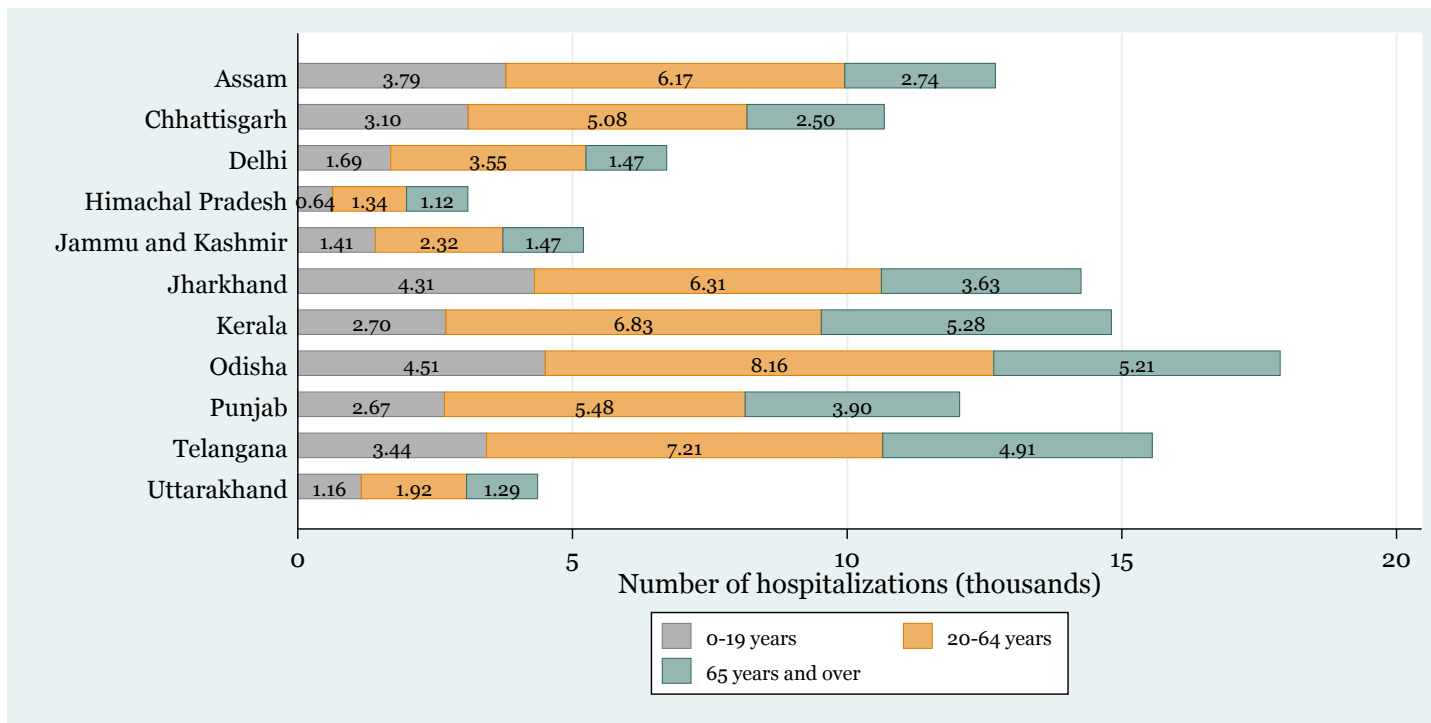
Note: Our assumptions are based on the study by Liu *et al.* (2020) [3]. The symptomatic rates for moderate symptomatic, severe symptomatic and critically ill symptomatic were calculated from Liu *et al.* based on the z-scores obtained from the mean age and standard deviation reported for each level of disease severity. The hospitalization rate was calculated as the sum of the severe symptomatic and critically ill symptomatic rates. Asymptomatic rates were calculated similarly to symptomatic rates and included both asymptomatic and mildly symptomatic cases.

1. International Institute for Population Sciences. National Family Health Survey. <http://rchiips.org/NFHS/nfhs4.shtml>.
2. Government of India. State/UT wise Aadhaar Saturation: 15th January, 2020. <https://uidai.gov.in/images/state-wise-aadhaar-saturation.pdf>.
3. Liu S, Luo H, Wang Y, Wang D, Ju S, Yang Y. Characteristics and Associations with Severity in COVID-19 Patients: A Multicentre Cohort Study from Jiangsu Province, China. SSRN. 2020. <http://dx.doi.org/10.2139/ssrn.3548753>.
4. Mizumoto Kenji, Kagaya Katsushi, Zarebski Alexander, Chowell Gerardo. Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020. Euro Surveill. 2020;25(10):pii=2000180. <https://doi.org/10.2807/1560-7917.ES.2020.25.10.2000180>.

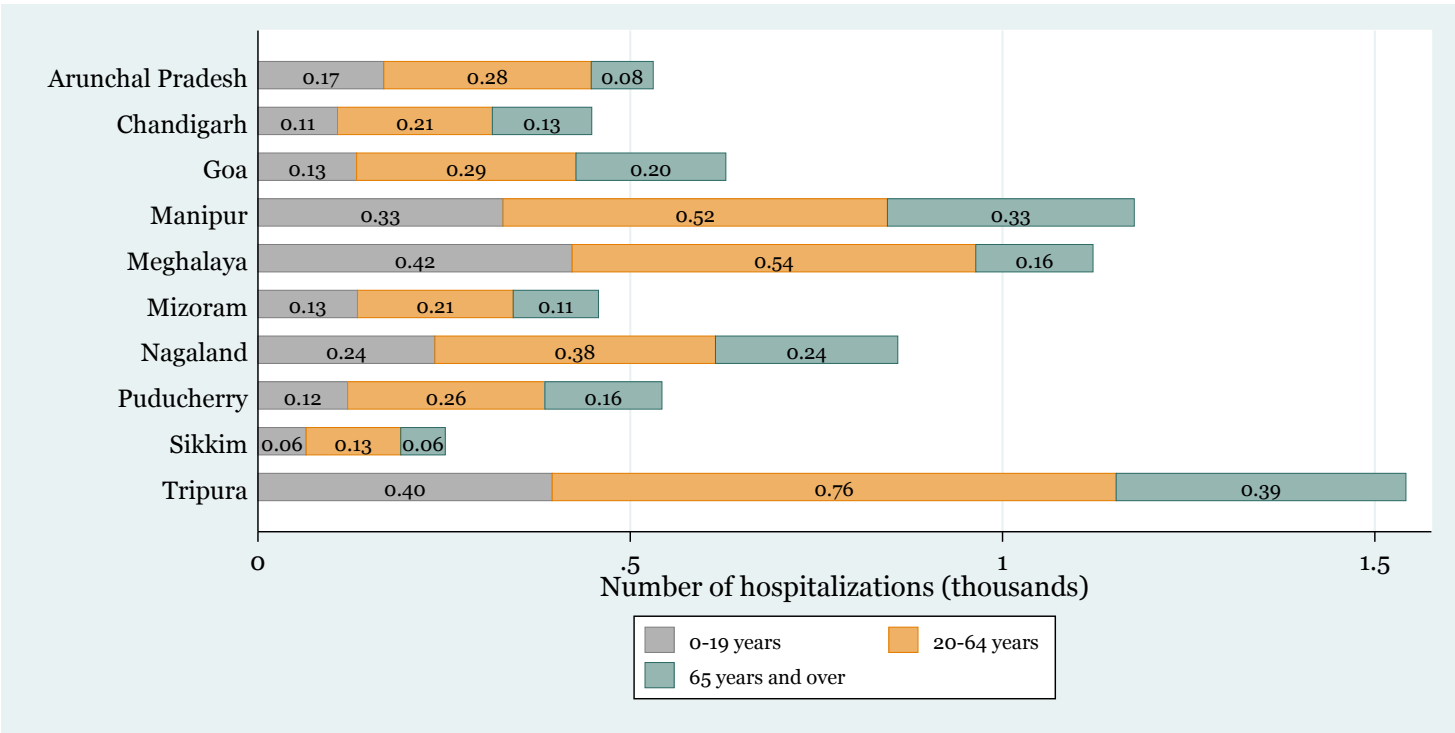
Estimated hospitalizations by age group if 0.5% of the population is infected (10 largest states)



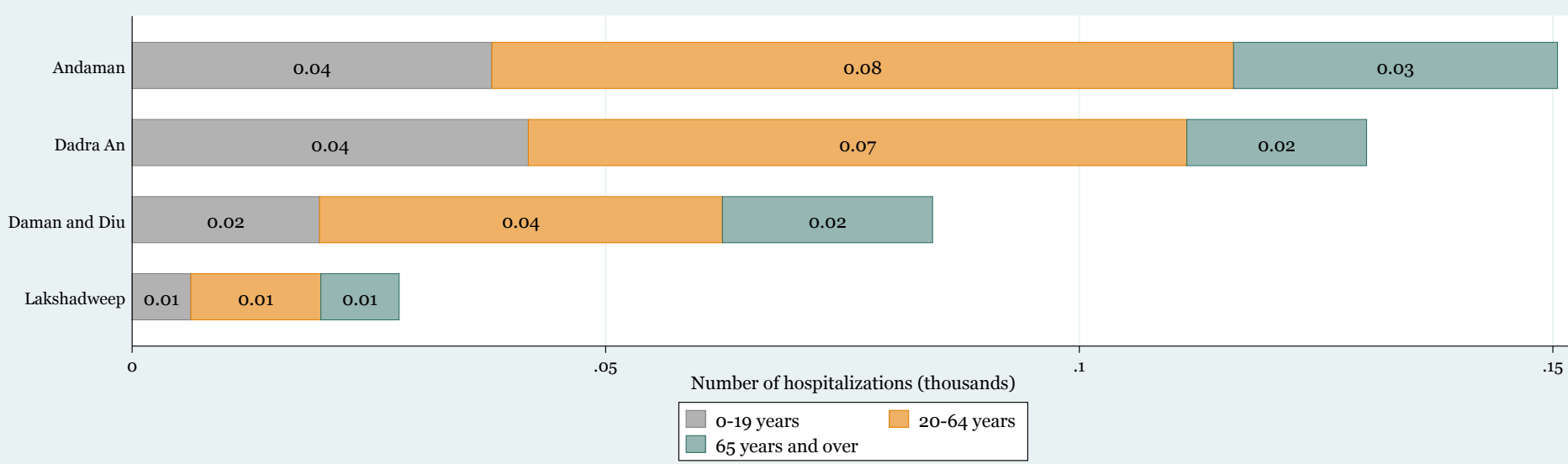
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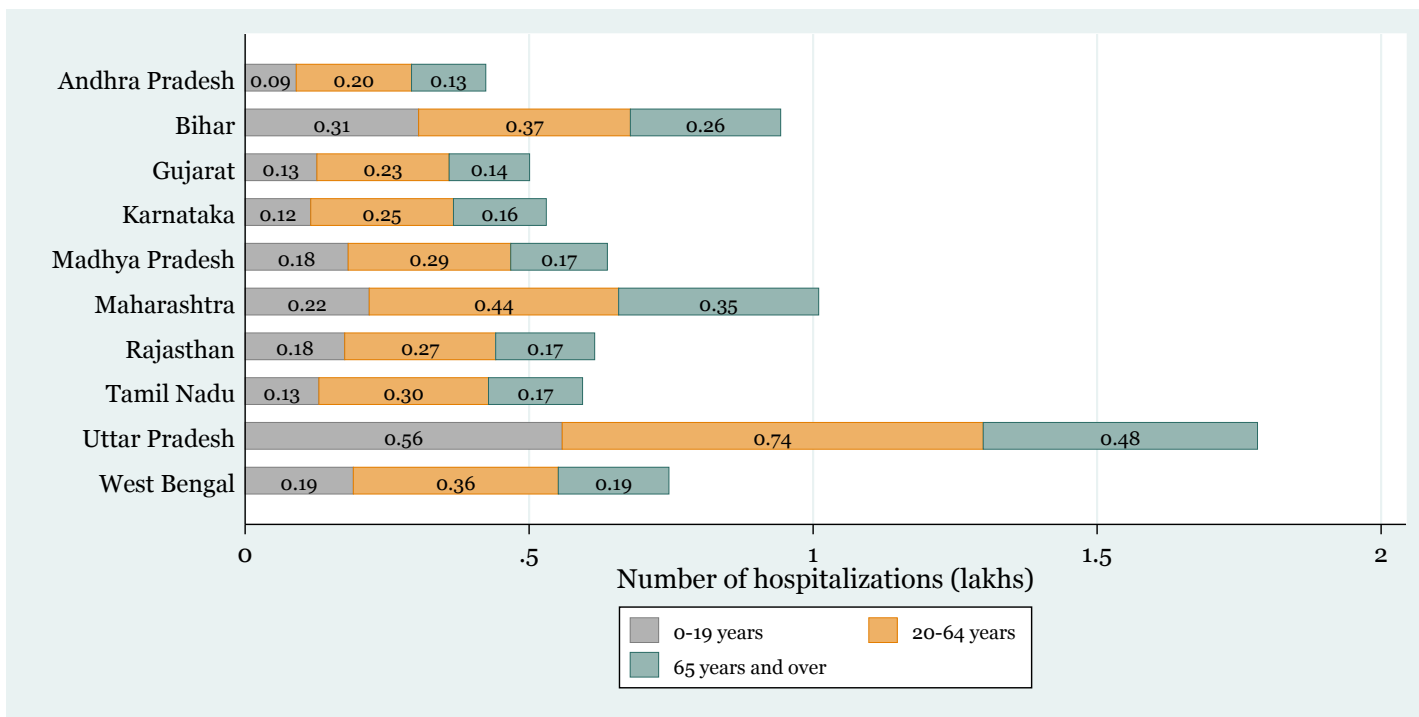
Estimated hospitalizations by age group if 0.5% of the population is infected (10 small-sized states)



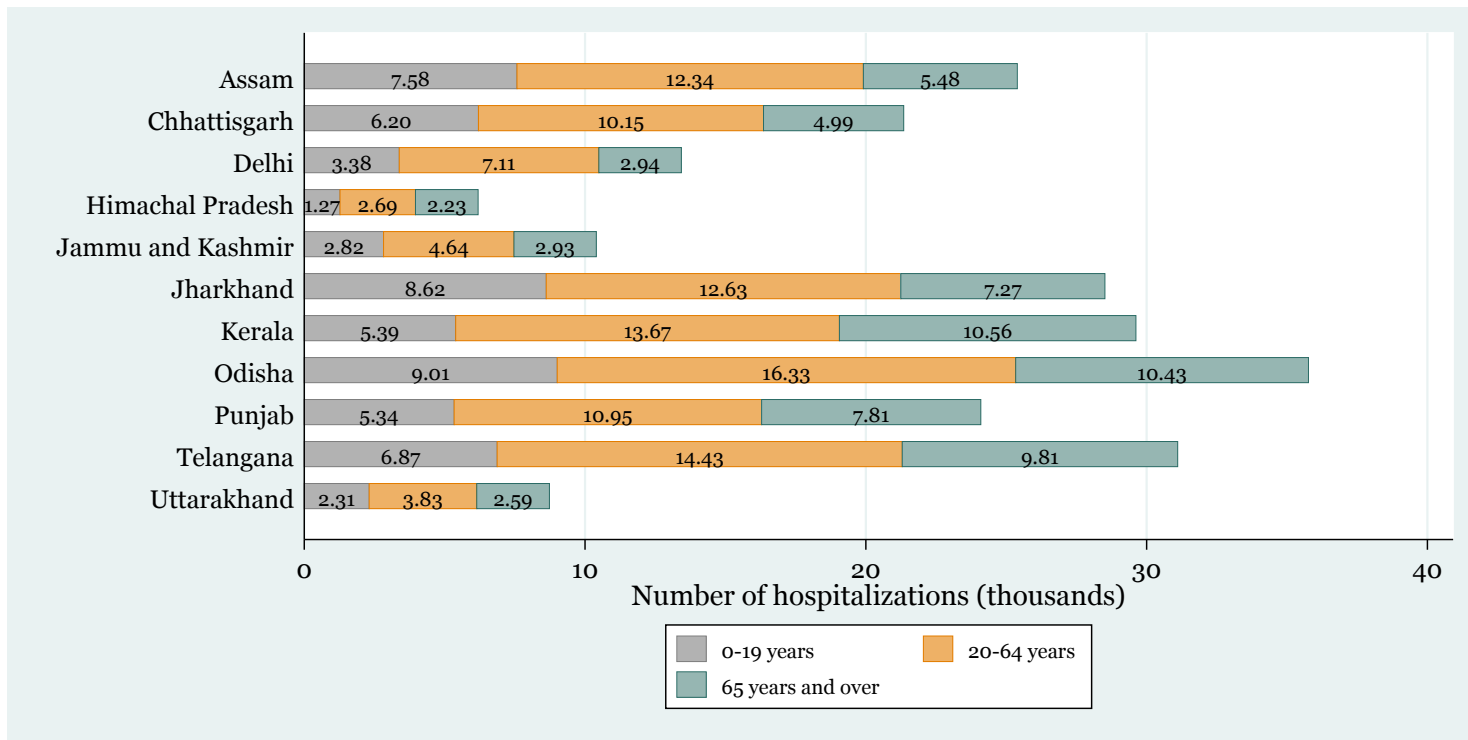
Estimated hospitalizations by age group if 0.5% of the population is infected (4 smallest states)



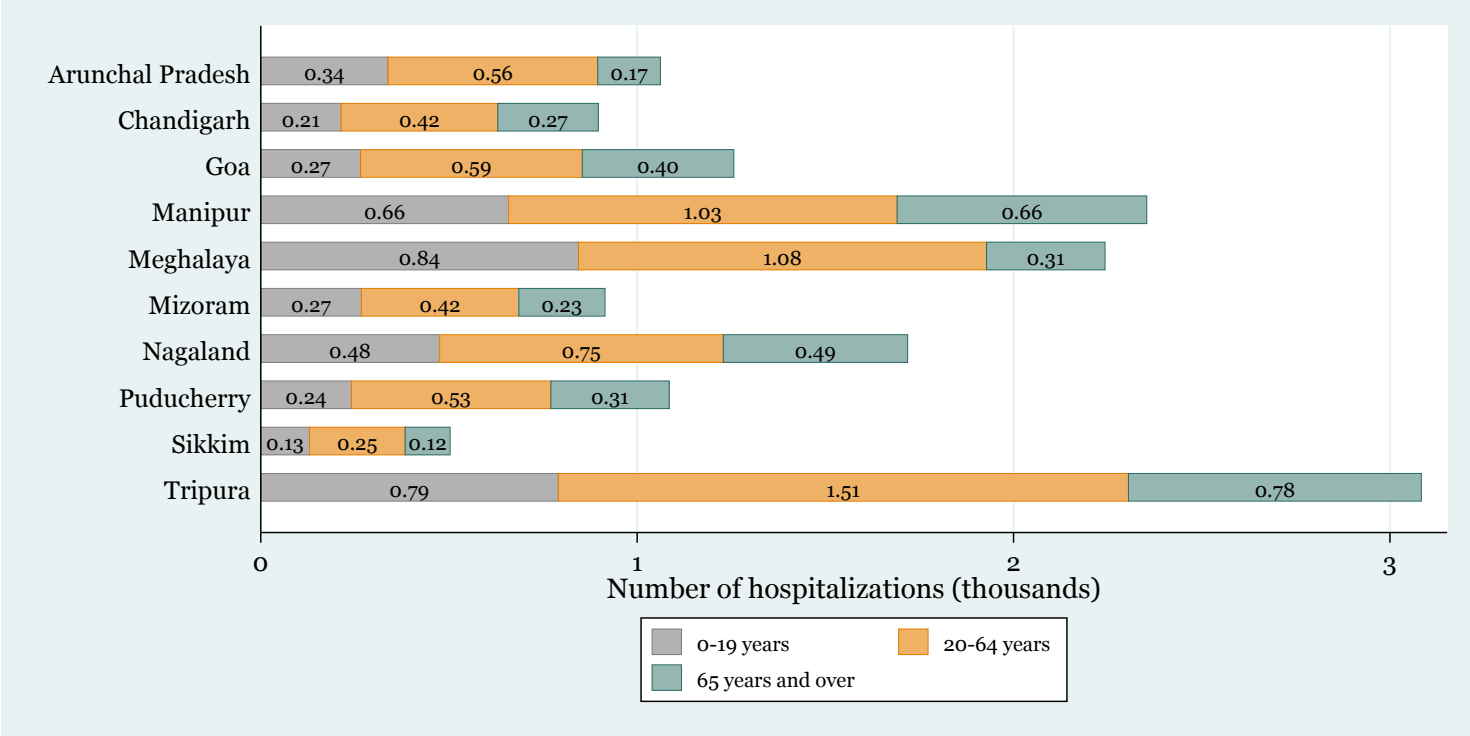
Estimated hospitalizations by age group if 1.0% of the population is infected (10 largest states)



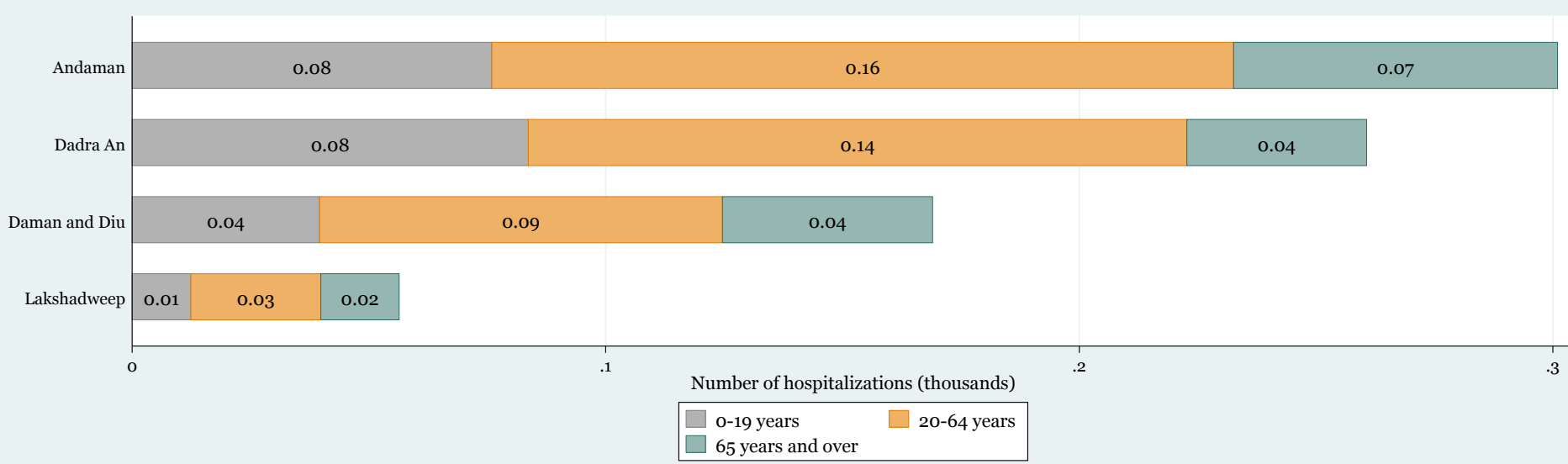
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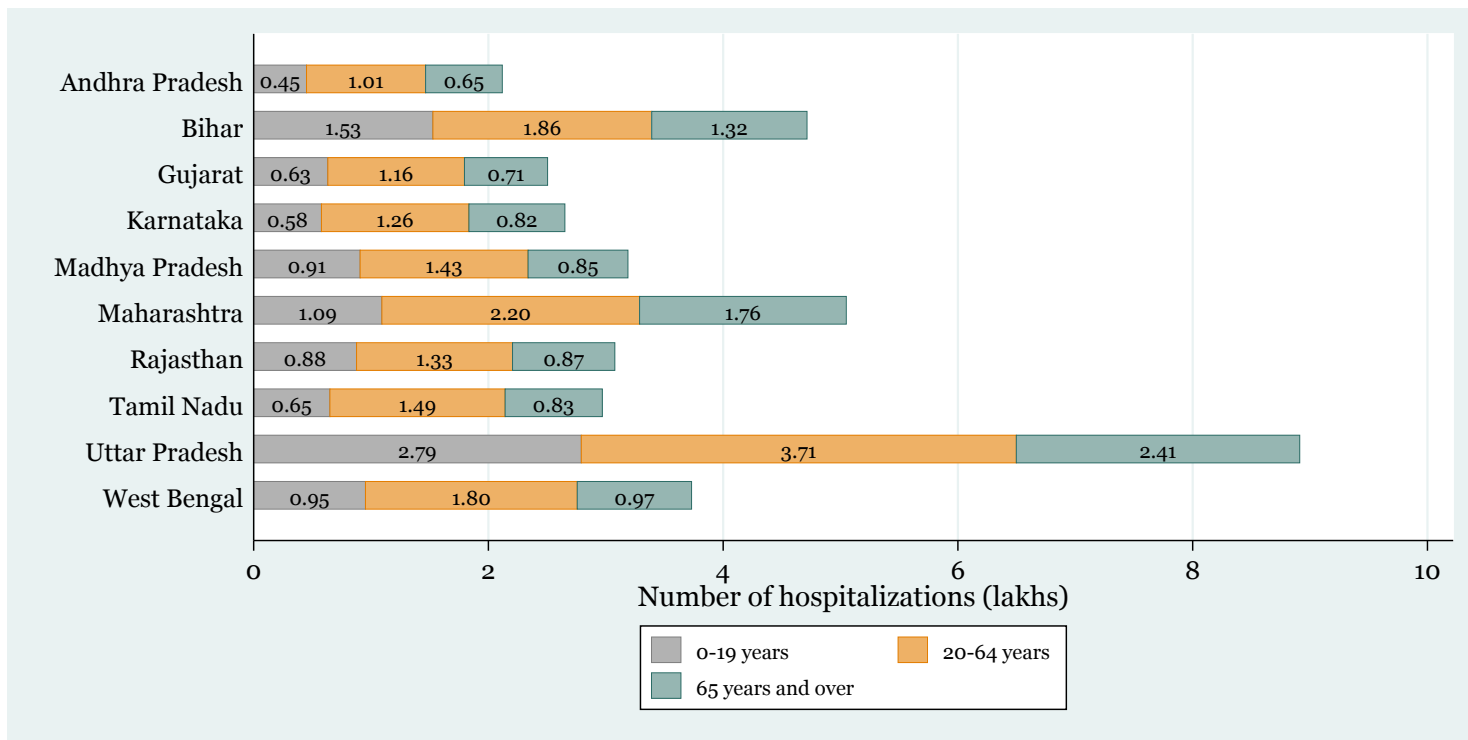
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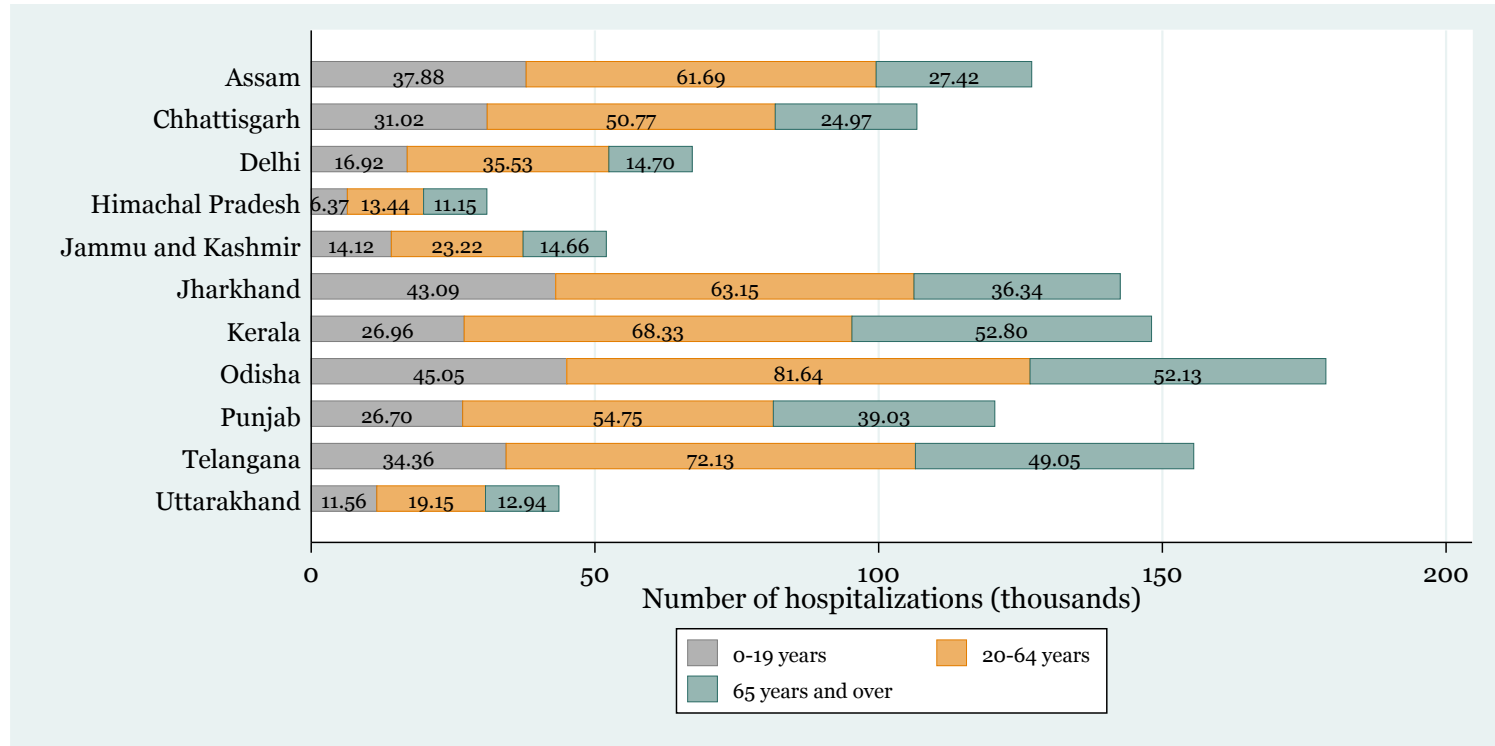
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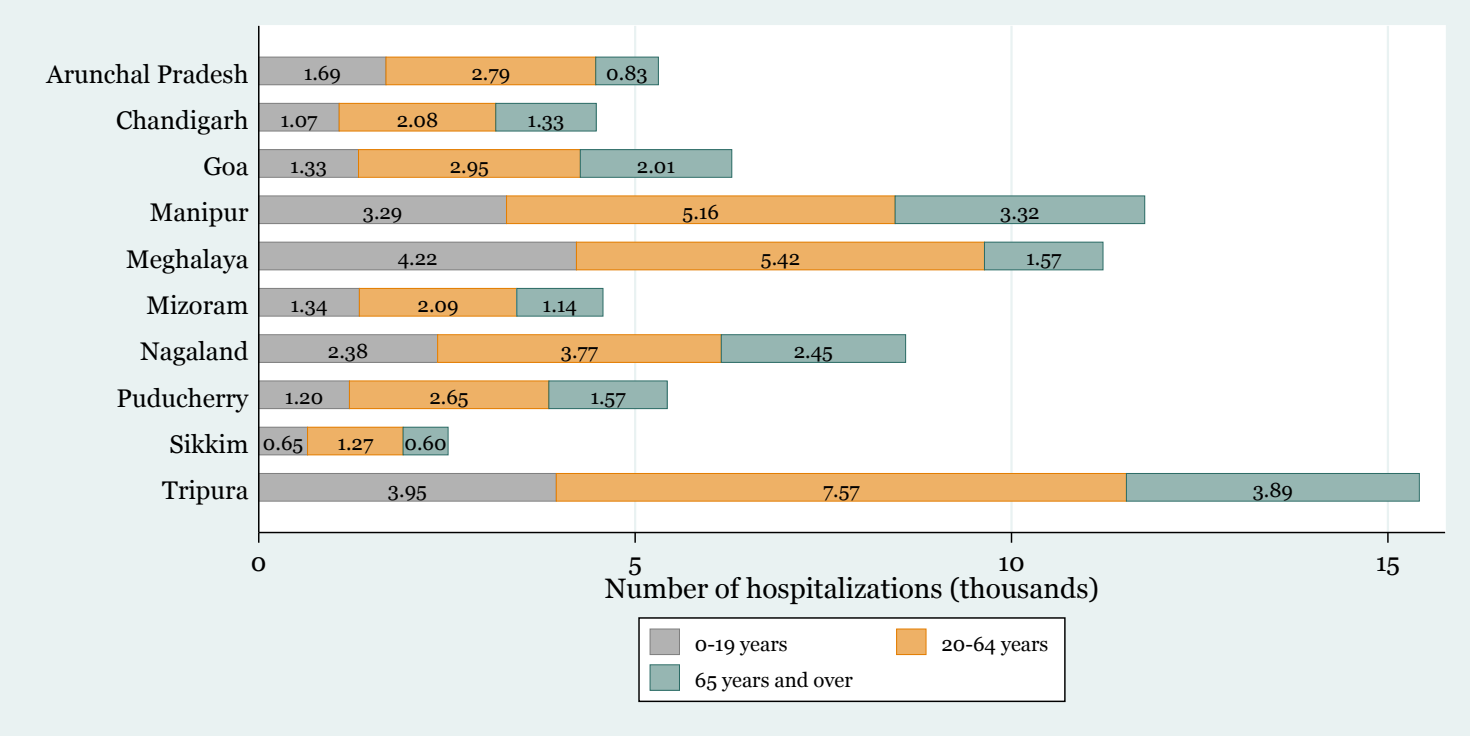
Estimated hospitalizations by age group if 5.0% of the population is infected (10 largest states)



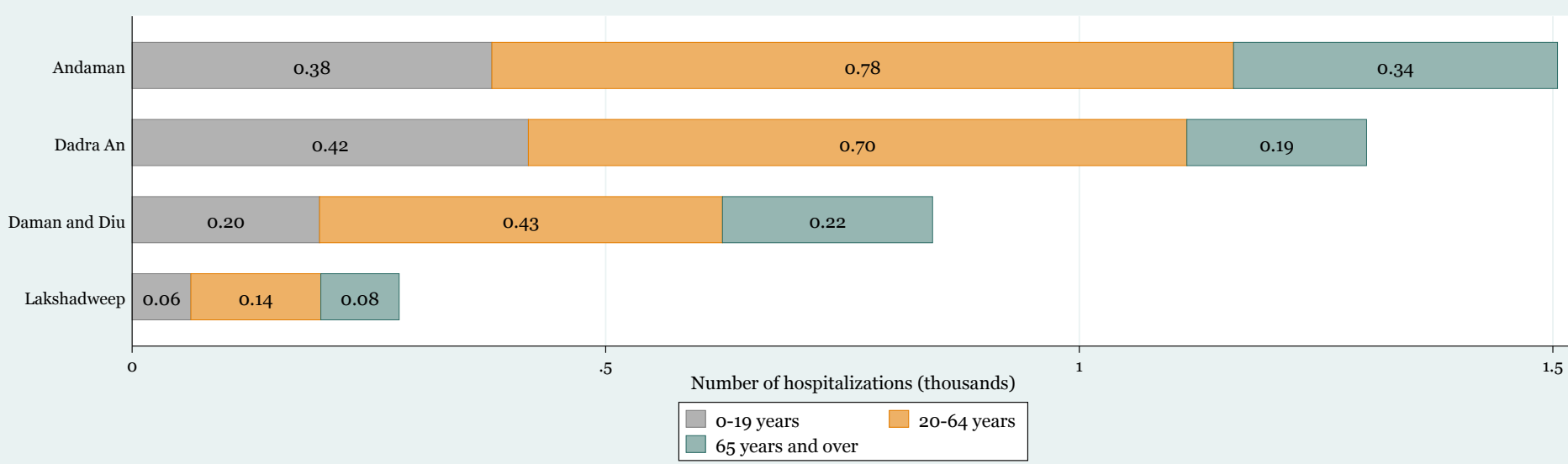
Estimated hospitalizations by age group if 5.0% of the population is infected (11 medium-sized states)



Estimated hospitalizations by age group if 5.0% of the population is infected (10 small-sized states)



Estimated hospitalizations by age group if 5.0% of the population is infected (4 smallest states)



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Thank you!