Supplement

Economic analysis

Here we describe how we obtained county-level estimates of childcare costs and wages. We use state-level child care costs from CCAoA and adjust them to county-level by applying the ratio between state-level and county-level fair market rents from HUD. We calculate state-level rents from HUD by taking population-weighted averages of county rents. To estimate the number of healthcare workers with children at the county-level, we take the state-level proportion of healthcare workers with children from IPUMS and apply it to the county-level number of healthcare workers from ACS. We then calculate the county-level cost of providing child care to healthcare workers by multiplying child care costs by the proportion of healthcare workers with children.

For estimating county-level wages, some counties with low populations had redacted wages to preserve anonymity. We used multiple imputation by chained equations to impute these cases. To get all county-level wages, we multiplied the number of healthcare workers (by occupation group and sex) by their subgroup-respective county-level median wages.

Absenteeism, complication factors, and wage maps

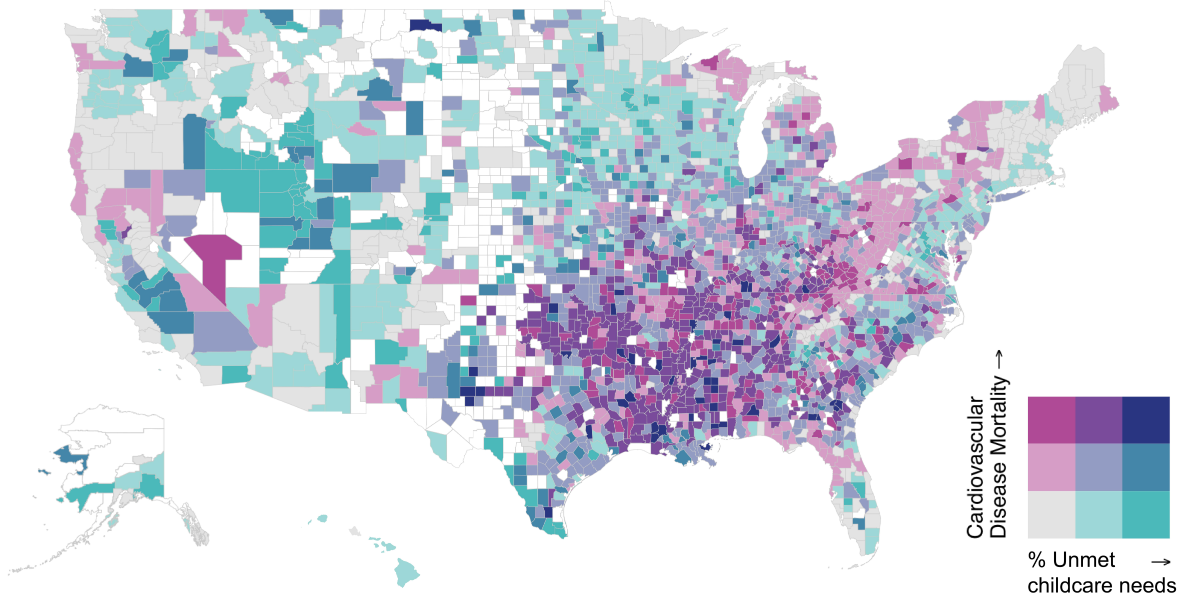

Figure 4. County-level comparison of percent absenteeism and cardiovascular disease mortality (deaths per 100,000 people). Counties with confidence interval sizes in the 90th percentile or below ($< \pm 5.95\%$) are shown.

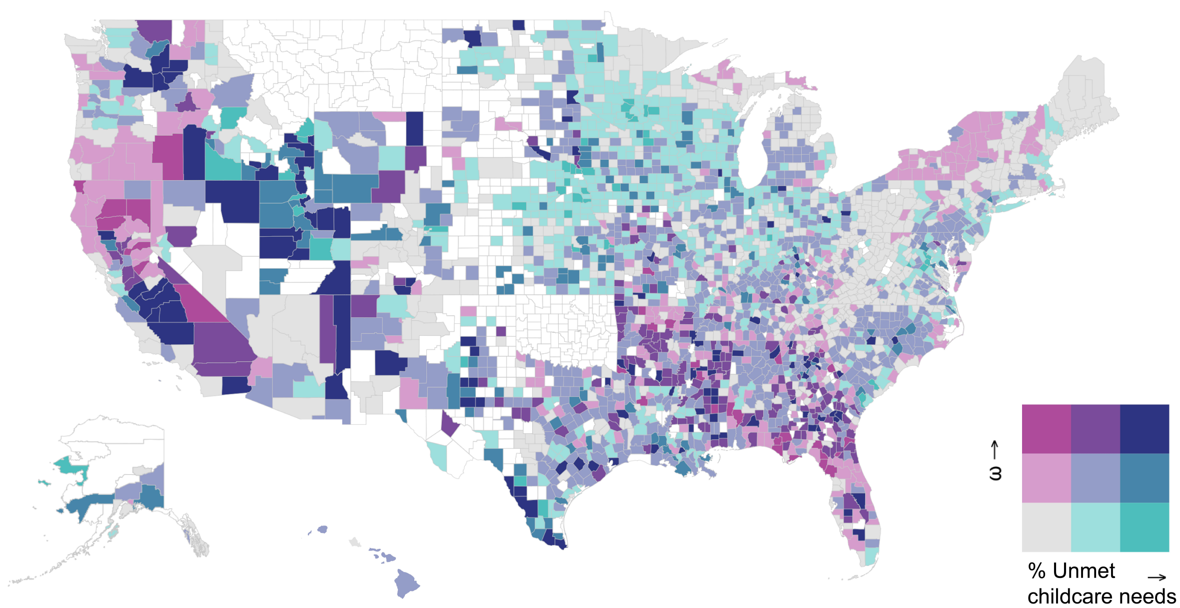

Figure 5. County-level comparison of percent absenteeism and ω. Counties with confidence interval sizes in the 90th percentile or below ($< \pm 5.95\%$) are shown.

SEIR Equations

$$
\begin{aligned}
\frac{\delta S_i}{dt} &= -p_a r_a \tau \beta_{i,} I^A S_i - (1-p_a) r_i \tau \beta_{i,} I^S S_i \\
\frac{\delta E_i}{dt} &= p_a r_a \tau \beta_{i,} I^A S_i + (1-p_a) r_i \tau \beta_{i,} I^S S_i - \sigma E_i \\
\frac{\delta I_i^S}{dt} &= (1-p_a)\sigma E_i - (\gamma+\mu) I_i^S \\
\frac{\delta I_i^A}{dt} &= p_a \sigma E_i - \gamma I_i^A \\
\frac{\delta R_i}{dt} &= \gamma (I_i^S + I_i^A)
\end{aligned}
\tag{1}
$$

Figure 6. Differential equations for SEIR models. i is the age group, $p_a = 0.83$ is the proportion of infected that are asymptomatic. $r_a = 0.5$ is the reduction of infectiveness of an asymptomatic individual. $r_i = 0.25$ is the reduction in interaction of a symptomatic individual. β_i is age stratified contact rates derived from a WAIFW matrix, τ is the probability of transmission given contact derived from R_0. The average length of incubation was set to $1/\sigma = 5.1$ days and the average length of infections was set to $1/\gamma = 6.5$ days.

Sensitivity analyses

Absenteeism estimate

Population seeds	All	Practitioners/Technicians	Support staff
$NHES_{0.89}$	7.5%	7.2%	7.9%
$IPUMS_{0.89}$	8.6%	9.2%	7.4%
$IPUMS_{0.6}$	7.3%	8.3%	6.3%

Table 2. Sensitivity analysis of absenteeism estimate using various population seeds. National Household Education Surveys Program (NHES) found that 50% of households had difficulty finding or could not find satisfactory child care. Integrated Public Use Microdata Series (IPUMS) are state specific seeds derived from the household structure of healthcare workers. Survey data from both the Pew Research Center and the US Census Bureau indicating that 89% of working couples rely on the mother for primary child care. To test sensitivity, we calculated absenteeism by assuming that 60% of working couples rely on the mother for primary child care.

Transmission models

R_0	Hospital beds: SC + HH	Hospital beds: SC	ICU beds: SC + HH	ICU beds: SC
2.0	7.38%	8.19%	7.22%	8.01%
2.5	5.91%	6.6%	5.87%	6.32%
3.0	4.71%	5.26%	4.58%	4.94%
3.5	4.16%	4.5%	3.98%	4.3%
4.0	3.49%	3.88%	3.25%	3.56%
4.5	3.23%	3.5%	3.01%	3.23%
5.0	2.79%	3.19%	2.54%	2.87%
5.5	2.43%	2.75%	2.29%	2.47%
6.0	2.31%	2.44%	2.16%	2.29%

Table 3. Sensitivity analysis of transmission models under varying R_0 values and contact conditions. School closures (SC) reduce the risk of child-child interactions by 90%. Household (HH) interactions increase child-other age group interactions by 10%. Both models assume social distancing, which reduces all interactions by 50%

Model output

The glm() calls for our models and model output are below.

```
modelDiabetes <- glm(stateEstMeans~Diabetes.prevalence.raw.value+
X..65.and.older.raw.value+femalePct+pctMarried+
                X..below.18.years.of.age.raw.value+
                X..Non.Hispanic.African.American.raw.value+
                factor(state)+
                X..Hispanic.raw.value+
                X..American.Indian.and.Alaskan.Native.raw.value
                +Population.raw.value+X..Rural.raw.value,
              weights=numHCW,family=quasipoisson,
              data=regressionData)
modelCVD <- glm(stateEstMeans~cvdMortality+
X..65.and.older.raw.value+
femalePct+fmr+pctMarried+
                X..below.18.years.of.age.raw.value+
                X..Non.Hispanic.African.American.raw.value+
                factor(state)+
                X..Hispanic.raw.value+
                X..American.Indian.and.Alaskan.Native.raw.value+
                Population.raw.value+X..Rural.raw.value,
              weights=numHCW,family=quasipoisson,
              data=regressionData)
modelControls <- glm(stateEstMeans~X..Rural.raw.value+
X..65.and.older.raw.value+
femalePct+fmr+pctMarried+
                X..below.18.years.of.age.raw.value+
                X..Non.Hispanic.African.American.raw.value+
                factor(state)+
                X..Hispanic.raw.value+
                X..American.Indian.and.Alaskan.Native.raw.value+
                Population.raw.value,
              weights=numHCW,family=quasipoisson,
              data=regressionData)

summary(modelDiabetes)
summary(modelCVD)
summary(modelControls)
```

Table 4. Regression output for models on diabetes, cardiovascular disease, percent rural, and controls.

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-4.25^{***}	-4.18^{***}	-4.23^{***}	-4.24^{***}
	(0.04)	(0.04)	(0.04)	(0.04)
Diabetes	0.22^{*}			
	(0.10)			
65.and.older	-0.85^{***}	-0.75^{***}	-0.82^{***}	-0.78^{***}
	(0.06)	(0.05)	(0.05)	(0.05)
femalePct	0.67^{***}	0.70^{***}	0.67^{***}	0.68^{***}
	(0.03)	(0.03)	(0.03)	(0.03)
pctMarried	0.29^{***}	0.22^{***}	0.27^{***}	0.27^{***}
	(0.02)	(0.02)	(0.02)	(0.02)
below.18	5.57^{***}	5.71^{***}	5.64^{***}	5.65^{***}
	(0.07)	(0.07)	(0.07)	(0.07)

	Model 1	Model 2	Model 3	Model 4
Non.Hispanic.African.American	0.05**	0.04*	0.05**	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Alaska	−0.23***	−0.26***	−0.24***	−0.24***
	(0.03)	(0.03)	(0.03)	(0.03)
factor(state)Arizona	−0.09***	−0.11***	−0.09***	−0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Arkansas	−0.06***	−0.06***	−0.06***	−0.06***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)California	−0.14***	−0.15***	−0.14***	−0.15***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Colorado	−0.01	−0.03*	−0.02	−0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Connecticut	0.03*	0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Delaware	−0.06*	−0.07**	−0.06*	−0.06**
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)DC	−0.09*	−0.10**	−0.10**	−0.10**
	(0.04)	(0.04)	(0.04)	(0.04)
factor(state)Florida	−0.03*	−0.04***	−0.03*	−0.03**
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Georgia	−0.07***	−0.08***	−0.07***	−0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Hawaii	−0.08***	−0.10***	−0.08***	−0.09***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Idaho	−0.01	−0.03	−0.02	−0.02
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Illinois	−0.04**	−0.05***	−0.04***	−0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Indiana	−0.04**	−0.05***	−0.04**	−0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Iowa	0.02	−0.00	0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)
factor(state)Kansas	−0.01	−0.03	−0.02	−0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Kentucky	−0.05***	−0.06***	−0.05***	−0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Louisiana	0.00	−0.01	−0.00	−0.00
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Maine	0.02	−0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Maryland	−0.01	−0.02	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Massachusetts	−0.01	−0.03*	−0.01	−0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Michigan	−0.05***	−0.06***	−0.06***	−0.06***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Minnesota	−0.01	−0.04**	−0.01	−0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Mississippi	−0.02	−0.02	−0.02	−0.02
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Missouri	−0.03*	−0.04**	−0.03*	−0.03**
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Montana	−0.02	−0.04	−0.03	−0.03
	(0.02)	(0.02)	(0.02)	(0.02)

	Model 1	Model 2	Model 3	Model 4
factor(state)Nebraska	−0.00	−0.03	−0.01	−0.01
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Nevada	−0.09***	−0.10***	−0.09***	−0.10***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)New Hampshire	0.04*	0.02	0.04	0.04
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)New Jersey	−0.07***	−0.08***	−0.07***	−0.08***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)New Mexico	−0.16***	−0.17***	−0.16***	−0.16***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)New York	−0.12***	−0.13***	−0.12***	−0.13***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)North Carolina	−0.00	−0.01	−0.00	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)North Dakota	−0.04	−0.06*	−0.04*	−0.05*
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Ohio	−0.06***	−0.07***	−0.06***	−0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Oklahoma	−0.07***	−0.07***	−0.07***	−0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Oregon	−0.04**	−0.06***	−0.05**	−0.05***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Pennsylvania	−0.00	−0.01	−0.00	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Rhode Island	−0.06**	−0.08***	−0.06**	−0.07***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)South Carolina	0.02	0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)South Dakota	0.00	−0.02	−0.00	−0.01
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Tennessee	−0.07***	−0.07***	−0.07***	−0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Texas	−0.14***	−0.15***	−0.15***	−0.15***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Utah	−0.07***	−0.09***	−0.08***	−0.08***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Vermont	0.04	0.01	0.02	0.02
	(0.03)	(0.03)	(0.03)	(0.03)
factor(state)Virginia	0.01	−0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Washington	−0.07***	−0.09***	−0.07***	−0.08***
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)West Virginia	−0.08***	−0.08***	−0.08***	−0.08***
	(0.02)	(0.02)	(0.02)	(0.02)
factor(state)Wisconsin	0.03*	0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)
factor(state)Wyoming	−0.07*	−0.09**	−0.08**	−0.08**
	(0.03)	(0.03)	(0.03)	(0.03)
Hispanic	0.16***	0.13***	0.15***	0.15***
	(0.01)	(0.01)	(0.01)	(0.01)
American.Indian.Alaskan.Native	0.00	−0.00	0.01	0.00
	(0.04)	(0.04)	(0.04)	(0.04)
Population	−0.00***	−0.00***	−0.00***	−0.00***
	(0.00)	(0.00)	(0.00)	(0.00)

	Model 1	Model 2	Model 3	Model 4
cvdMortality		-0.00^{***}		
		(0.00)		
Rent		0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)
Rural			0.02^{*}	
			(0.01)	
AIC				
BIC				
Log Likelihood				
Deviance	1217.25	1207.57	1212.11	1216.79
Num. obs.	2857	2854	2850	2854

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$