

Potential labor supply consequences of closing primary schools in Sweden, with a focus on health care occupations

March 22, 2020

Carl Nordlund, PhD (carl.nordlund@liu.se)

Karl Wennberg, PhD (karl.wennberg@liu.se)

Full results: https://demesta.com/download.php?doc=counties_aggr.xlsx

This report: https://demesta.com/download.php?doc=covid_school_closures.pdf

Background: School closures to hamper spreading of disease during a pandemic

Similar to other countries in the world battling the coronavirus pandemic of 2020, decision-makers in Sweden have adopted the strategy of increased *social distancing*. Indicated by epidemiologists [as the most effective strategy to slow the diffusion of the virus](#), the aim of social distancing is to slow down the spread of the virus to such an extent that the health care system is not overburdened by those most severely affected by the disease (Covid-19) caused by the virus.

To increase social distancing, policy-makers adopt a variety of policy tools. In Sweden as of March 20, 2020, this includes prohibiting gatherings with more than 500 participants, encouraging workers to avoid commuting to their workplace and, when possible, instead encouraging working from home. Additionally, all upper secondary and tertiary education, i.e. high schools, vocational schools, universities and colleges, have switched to distance teaching. The government has also prepared the necessary judicial framework to also close primary schools, but [in stark contrast](#) to virtually all other European countries, Sweden has chosen to keep its primary school open for the time being. This is in line with the advice from all relevant government agencies, many which have [explicitly expressed](#) the importance of *not* closing primary schools.

The public's trust in how the government and institutions are handling the coronavirus outbreak is [relatively high](#) in Sweden, but the decision to keep primary schools open is heavily [debated](#).

The main argument in favor of closing schools is that of social distancing: closing of schools will not only decrease interactions between pupils, but also between pupils vis-à-vis other individuals on their way to and from schools. A prerequisite for this to work is of course that pupils then actually stay at home, without substituting the schools with other public arenas for social interaction.

Other arguments in favor of keeping schools open have been proposed. One argument is that it is too early: although indeed a potential tool to increase social distancing, opponents to closing schools have argued that we are not yet at the point when such drastic measures are needed. Rather, it is argued that it is [prudent to wait](#) with such measures until when they will have the best effect on reducing transmissions. Another argument is that the closing of primary schools would place a large additional burden on our society. The main reasoning here is that the closing of schools would force many working parents to stay home with their children, many of which work in jobs that are critical in our handling with the current situation – [particularly individuals working in health care](#). The potential magnitude of this latter line of argument is the focus of our report.

Research question: what are the effects of closing primary schools?

What effect would the closing of primary schools in Sweden have on the health care sector? If primary schools were to close: which parents/caretakers would then have to spend time at home

with their children, and what jobs would these parents then be unable to perform? How would the health care sector be affected in particular, and in what way to these negative effects differ across regional counties (which constitute the providers of health care) in Sweden?

The initial pilot study

To estimate such figures, we designed and implemented a pilot study that utilize recent historical Swedish microdata for 2017. We thus analyzed the the complete population of children attending primary school (grade 1 to 9, including preschool for 6-year olds), the location of their schools, and the occupations of their parents/caretakers. While historical demographics from three years ago can of course only provide an approximation of the actual number of children in primary education and their parents/caretakers in Sweden today, we do know that demographic and labor market trends have been relatively stable in Sweden, and that few schools have closed/moved/started during this period. For larger (smaller) regions there has been a slight increase (decrease) in the number of children due to urbanisation, but overall we gauge that the margin of error should be a few percentages.¹

Our pilot study found that approximately 9,800 doctors and 25,300 nurses could end up at home instead of working in case all primary schools (grade 0 to 9) in Sweden were to close. For Stockholm municipality, a total of 1,200 medical doctors and 1,500 nurses could be staying at home with their kids if the primary schools were to close. This initial pilot study was presented in a debate article in [Dagens Nyheter](#).

Research design of the main study

To extend and validate the pilot study we expanded this to scrutinize a number of theoretically and practically relevant assumptions. The original question remains:

What effect could we expect for the labor supply of people working in the health care sector if public schools were to close today?

For this study, four modifications were made:

- Rather than covering all children in grade 0-9, we exclude pupils in grades 7-9. Following the social insurance regulations for staying home with a sick kid (VAB, 'Vård Av Barn'), we thus assume that children older than 12 are old enough to be left at home alone for an extended period of time. However, as there indeed would be a difference between a sick pupil staying bedridden at home for a few days, and a child aged 12-15 expected to study at home without supervision, using VAB as a benchmark might not hold in this case.
- In the pilot study we only measured the impact on the health care sector in terms of number of medical doctors (ssyk occupation code 221²) and nurses (ssyk 222-223) that would likely be missing from work. The current study is more comprehensive, this time also including assistant nurses (undersköterska; ssyk 532) and care assistants (vårdbiträden; ssyk 533), equally critical professions for functioning health care.
- Whereas both studies build on micro data at an very high spatial resolution, the main study aggregates the findings to the country (län) level, rather than the municipal level of the pilot study. Going from 290 municipalities to 21 countries should imply more accurate estimates.

¹ Percentage differences in the number and percentages estimated, i.e. not percentages point differences.

² All occupations are coded from Swedish ILO-equivalent occupation codes SSYK ('Standard för svensk yrkesklassificering').

- In most of the cases observed, a child lives with both its parents. To resolve which of these two parents would stay at home in case of a school closure, we assumed that parents would share this between themselves on a 50-50 basis. This was implemented by increasing the respective counters for the two job categories by 0.5. For this main study, we supplemented this with 3 alternative assumptions of household behaviors regarding which of the two parents would stay at home:
 - *Population average gender division of caretaking in households*: Using empirical data on how parents chose to split the days taking care of their sick children in 2017 (VAB), this assumption of household behavior would let the average female stay at home 62% of the time and the average male 38% of the time. We operationalized this by increasing the counters for their respective job categories by 0.62 and 0.38.
 - *Economically optimizing households* ('Beckerian rational choice'): looking at the wage incomes for both parents of a child, this assumption implies that the parent with the lower relative wage will remain at home taking care of children.
 - *Altruistic household behavior*. This last assumption we test implies that if only one parent has a job deemed critical, here specified as either a medical doctor, a nurse, an assistant nurse, or a care assistant, the other parent will stay at home with children. If both, or neither, of parents has a critical job, they will share the child care equally (i.e. 50-50)

Data

The algorithm underlying our analysis builds on a dataset of all children attending primary school in Sweden for the year 2017 (the latest data we currently have available). This data was combined with data on schools, parents, residential locations of children and parents, locations of schools, and wage incomes as well as occupational codes³ of parents.

Each child was implemented as an object with the following attributes (all locations in both high-resolution X,Y coordinates as well as municipalities and counties):

- Grade/Year (årskurs)
- Residential location of child
- Residential locations of respective parent
- Location of school
- Employment status of respective parent
- Wage incomes (yearly) for respective parent
- Occupational codes (SSYK3) for respective parent

Each county was also implemented as an object, with the following attributes

- County id/name
- Discrete count variables for each occupational code (associative array)

³ We excluded all military personnel in our analyses.

Calculation heuristic

Our calculation algorithm was designed as follows:

Start with the first child in the dataset.

1. Check if the child lives with one or both of its parents
 - a. Only living with one parent: mark this parent as the assumed caretaker
 - i. Is this parent already marked as staying home? Yes: current child is a sibling of a previous child; continue with next child (→1)
 - ii. Is this parent not in gainful employment ($\text{SyssStat11} < 1$)? Assume that this parent can take care of child without labor market consequences. Mark parent as staying at home, continue with next child (→1)
 - iii. Parent in gainful employment: obtain occupational code of this parent and increase the count variable (+1) for this occupation in the particular region that the child lives. Mark parent as staying home, continue with next child (→1)
 - b. Living with two parents
 - i. Is one of these parents already marked as staying home? Yes: current child is a sibling of another child; continue with next child (→1)
 - ii. Is one of these parents not in gainful employment? Assume that this parent can take care of child with labor market consequences. Mark parent as staying at home, continue with next child (→1)
 - iii. Both parents working: apply household heuristics (one of the 4 below). Continue with next child (→1)

Household heuristics: four possible household behaviour (each given two parents, both caretakers)

- A. Equal: both parents share childcaring duties equally. Increase the count variables for respective parents' occupational codes with 0.5 in this particular region. Mark both parents as staying home (so they won't get picked again for siblings)
- B. VAB percentages: as above, but divide duties so that females do 62% and males 38%. Increase the count variables for the mother's occupational code with 0.62 and that for the father's with 0.38. Mark both as staying home.
- C. Maximized total incomes: Check income of both parents. For the parent with the lower relative income: increase the count variable for this parent's occupational code with 1, mark as staying home.
- D. Altruistic: Check parents' occupational codes for critical health care jobs (medical doctor, nurse, assistant nurse, care assistant).
 - a. If only one parent has a critical job, mark the other one as staying at home, increase the count variable of the non-critical parent's occupational code with 1.
 - b. If both have critical jobs, or if neither has, mark both as staying home, increase the count variable of the occupational codes for respective parent by 0.5.

Results⁴

If Sweden were to close all its primary schools and only children in grade 0-6 will require a parent/caretaker to stay home with the child, our analysis finds that this would correspond to approximately 620,000 individuals would be unable to go to work. This correspond to approximately

⁴ Assuming the number of children, schools, and parents' occupation in 2017 remains relatively similar to those for 2020:

13% of the working population. At the regional level, these numbers reflect the overall populations of respective regions, where the counties of Stockholm and Västra Götaland would have the highest numbers of 'lost' jobs (152,000 and 105,000), while Gotland would only 'lose' 3,500 jobs.

Whereas the total numbers remain the same irrespective of which of the four household behaviors that is used, the four behaviors have different effects on the number of medical jobs not performed if schools were to close. In scenario A, i.e. where two caretaking parents were to share the child care equally, a total of 61,000 health care jobs would be threatened. In scenario B, i.e. where females are more likely to stay at home (irrespective of job types and/or salaries), this would result in a total of 68,000 health care jobs being lost. In scenario C, where households optimize their total incomes, this number would increase to 75,000 jobs. In the final scenario, where critical jobs are always prioritized by the individual households (either on the basis of altruism or policy that makes such a choice economically more beneficial), the estimated number of health care jobs that would be lost to child caring would only be 26,000.

Results in table below (also available as a spreadsheet– see hyperlink at the top of this document).

County	Total existing jobs	Threatened jobs	% threatened job	A: Equal 50-50					B: VAB percentages (Women: 62%, Men: 38%)				
				Doctors	Nurses	Assistant nurses	Care assistants	Total	Doctors	Nurses	Assistant nurses	Care assistants	Total
Stockholms län	1 182 045	151 860	12.8%	1 864	3 203	4 380	1 597	11 043	1 916	3 676	4 821	1 715	12 129
Uppsala län	181 829	23 692	13.0%	393	736	939	259	2 326	393	838	1 047	279	2 557
Södermanlands län	132 163	17 404	13.2%	151	572	957	279	1 958	148	645	1 073	299	2 166
Östergötlands län	215 915	27 496	12.7%	385	755	1 323	359	2 822	393	879	1 488	392	3 151
Jönköpings län	177 912	23 300	13.1%	211	782	1 182	212	2 385	216	911	1 360	234	2 721
Kronobergs län	95 483	12 161	12.7%	91	361	669	138	1 258	92	415	768	152	1 427
Kalmar län	114 295	13 601	11.9%	141	458	770	276	1 644	142	527	878	302	1 849
Gotlands län	28 764	3 523	12.2%		106	174	76	388		121	194	82	428
Blekinge län	72 350	9 448	13.1%	87	379	643	88	1 197	85	433	723	95	1 336
Skåne län	610 157	77 121	12.6%	1 038	2 154	3 659	772	7 622	1 045	2 475	4 108	837	8 465
Hallands län	161 219	22 941	14.2%	248	708	967	202	2 123	251	819	1 101	221	2 391
Västra Götalands län	838 912	104 747	12.5%	1 191	3 043	5 104	941	10 277	1 215	3 484	5 719	1 025	11 443
Värmlands län	130 226	15 507	11.9%	155	501	947	186	1 788	157	578	1 063	201	1 998
Örebro län	141 444	17 865	12.6%	207	615	1 021	178	2 020	207	703	1 147	194	2 252
Västmanlands län	125 938	15 729	12.5%	143	480	918	298	1 838	145	549	1 026	326	2 046
Dalarnas län	134 963	16 866	12.5%	177	620	1 010	296	2 103	179	702	1 128	315	2 324
Gävleborgs län	132 521	16 136	12.2%	159	574	991	309	2 033	159	648	1 105	333	2 246
Västernorrlands län	116 946	15 146	13.0%	147	520	801	306	1 773	149	585	892	328	1 955
Jämtlands län	64 649	8 283	12.8%	127	350	477	98	1 051	125	393	530	105	1 152
Västerbottens län	133 517	17 051	12.8%	313	657	831	264	2 064	321	741	928	289	2 278
Norrbottnens län	123 880	14 251	11.5%	132	557	728	234	1 651	133	635	815	260	1 844
Total Sweden	4 915 128	624 128	12.7%	7 355	18 125	28 485	7 362	61 359	7 469	20 758	31 915	7 984	68 157

County	Total existing jobs	Threatened jobs	% threatened job	C: Maximized household incomes					D: Altruistic behavior (sparing critical jobs)				
				Doctors	Nurses	Assistant nurses	Care assistants	Total	Doctors	Nurses	Assistant nurses	Care assistants	Total
Stockholms län	1 182 045	151 860	12.8%	1 570	4 254	5 291	1 894	13 009	725	1 037	2 261	940	4 963
Uppsala län	181 829	23 692	13.0%	282	946	1 265	317	2 810	167	253	428	153	1 000
Södermanlands län	132 163	17 404	13.2%	104	670	1 288	339	2 401	78	211	441	178	907
Östergötlands län	215 915	27 496	12.7%	246	994	1 793	449	3 482	194	184	586	199	1 162
Jönköpings län	177 912	23 300	13.1%	139	1 036	1 720	294	3 189	105	176	408	98	786
Kronobergs län	95 483	12 161	12.7%	50	466	954	184	1 654		93	229	72	434
Kalmar län	114 295	13 601	11.9%	91	569	1 068	370	2 098	89	146	295	147	676
Gotlands län	28 764	3 523	12.2%		133	218	83	454			84		172
Blekinge län	72 350	9 448	13.1%	60	501	867	112	1 540	55	114	291	57	516
Skåne län	610 157	77 121	12.6%	696	2 731	4 831	990	9 248	460	660	1 641	446	3 206
Hallands län	161 219	22 941	14.2%	171	953	1 355	265	2 744	127	189	382	106	802
Västra Götalands län	838 912	104 747	12.5%	843	3 941	6 753	1 231	12 768	556	914	2 266	517	4 252
Värmlands län	130 226	15 507	11.9%	90	618	1 276	229	2 213	90	159	434	114	796
Örebro län	141 444	17 865	12.6%	140	726	1 367	213	2 446	121	192	460	102	874
Västmanlands län	125 938	15 729	12.5%	98	596	1 201	388	2 283	76	156	440	162	833
Dalarnas län	134 963	16 866	12.5%	105	731	1 348	364	2 548	92	227	476	189	983
Gävleborgs län	132 521	16 136	12.2%	110	714	1 311	393	2 528	93	228	480	192	992
Västernorrlands län	116 946	15 146	13.0%	79	632	1 037	386	2 134	74	198	378	184	834
Jämtlands län	64 649	8 283	12.8%	69	409	575	118	1 171	77	133	236	57	501
Västerbottens län	133 517	17 051	12.8%	221	783	1 129	364	2 497	130	201	366	129	825
Norrbottens län	123 880	14 251	11.5%	81	685	971	314	2 051	76	202	319	111	707
Total Sweden	4 915 128	624 128	12.7%	5 245	23 088	37 618	9 297	75 268	3 380	5 669	12 897	4 147	26 221