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Occupational Exposure to Social Distancing: A Preliminary Analysis using O*NET Data

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Introduction

The growing risk of contracting Covid-19 has prompted calls in many nations to engage in Social Distancing. This is a deliberate effort to reduce the transmission of the disease in businesses, schools, and gathering places. In the United States, the Centers for Disease Control (CDC) developed guidelines for homes, schools and childcare programs, universities, as well as businesses, community and faith based organizations and for large events. The CDC also issued guidelines for healthcare settings, first responders and within homeless shelters.[1]

The scale of this Social Distancing has no recent event with which to compare. A large share of colleges and universities have transitioned to wholly online learning, with many asking students to leave campus. Several schools around the nation have closed to prevent the spread of Covid-19 and a number of employers are transitioning large portions of their workforce to 'work at home' activities.[2]

Guidance to businesses includes recommendations to prepare for absenteeism from sick employees, as well as preparation for employees to remain at home to care for children following the closure of schools. Businesses are advised to rehearse these plans, and offer flexible schedules. They have also suggested broad responses to disease outbreak,

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[1] See https://www.cdc.gov/coronavirus/2019-ncov/community/index.html

[2] See https://www.businessinsider.com/companies-asking-employees-to-work-from-home-due-to-coronavirus-2020, https://www.cnn.com/2020/03/09/us/coronavirus-university-college-classes/index.html and https://www.usnews.com/news/education-news/articles/2020-03-11/seattle-public-schools-close-due-to-coronavirus-first-major-system-to-announce-prolonged-closure for recent examples.

including working at home, distancing of employees at work, and other measures to reduce human to human contact. [3]

A local outbreak of Covid-19 would obviously result in significant business disruption. However, guidance to large public event organizers (conferences, sporting events) have resulted in widespread cancellation of events to comply with CDC recommendations. Households have also been advised to limit public contact during an outbreak. These protections currently reduce demand for several types of private services, including transportation, restaurant service, recreational activities, and tourist-related services such as hotels.

Given observations in nations which have responded to Covid-19, such as China, Korea, and Italy, a long-term end to significant commercial economic activity seems plausible in many locations. Research on the economic effect of broad business interruption is nearly non-existant. While much research focuses on natural disasters and business interruption, these are either geographically isolated (Rose or Lim, 2002) or focus on discrete events such as terrorist attacks (Rose, Aladosu and Liao, 2007). There is also analysis computing broad effects for civil litigation (Foster and Trout, 1989 and Yang, Kajitani, Tatano and Jiang, 2016).

Literature examining Severe Acute Respiratory Syndrome (SARS) on tourism in Asia (Siu and Wong, 2004, Zheng, Carter, DeLacy, 2005 and Kim, Moore and Chase, 2009). The Congressional Budget Office (CBO) modeled two pandemic scenario involving Avian Flu (H1N1 virus). The two scenario's were based on a) the 1918-19 Spanish Flue, with 90 million illnesses and 2 million deaths, and b) two smaller pandemics in the 1950's and 1960's in which 75 million persons were infected, resulting in 100,000 deaths.

The CBO narrative of the larger pandemic scenario accounted for a surge in healthcare demand, then a reduction in retail and similar spending due to self-quarantine and Social Distancing, though that term was not then used. The result was a net decline of 4.25 percent in GDP for the year. Under the more modest scenario, GDP experienced a 1 percent reduction (CBO, 2006)

The modeling for both scenario's involved assumptions regarding demand shocks. Under the severe scenario, they assumed a 67 percent reduction in air, rail and transit movement, a 15 percent increase in education, an 80 percent reduction in arts and recreation, accommodation and food service. They assumed a 10 percent decrease in agriculture, mining, construction, manufacturing, wholesale and retail trade.

[3] https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html

The mild scenario had much smaller effects, a 20 percent reduction in the arts and recreation, accommodation and food service, a small boost in healthcare spending and a 17 percent reduction in travel.

McKibbin and Fernando (2020) modeled global impact of the Covid-19 virus across seven different mortality based scenarios. The impact in the USA ranged from a mild, 0.1 percent reduction in GDP to an 8.4 percent under the worst scenario, involving 1.06 million deaths.

None of these provide good evidence or method for isolating the long term effect of Social Distancing. While that is a very broad topic, we focus on one component, the risk to individual occupations of the Social Distancing now recommended by the CDC in the case of a local Covid-19 outbreak.

Our Estimate

To evaluate occupational exposure to Social Distancing we use data from the O*NET, which is a US Department of Labor sponsored data product which evaluates a variety of worker, and job related characteristics of each occupation. The O*NET data uses an expanded version of Occupational and Employment Statistics. Among the O*NET occupational context measures are scaled measures for each occupation's "work with others" and "physical proximity to others." These indices, ranging from 1-100, and provide some inference on the requirements of personal contact and proximity of workers in these occupations.

The intersection of personal contact and personal proximity is important in understanding the risk of exposure to Social Distancing of these jobs. Some occupations may have close personal contact between employees, but this may be done telephonically or by other means of communications. These jobs obviously would not be at risk of a negative demand shock due to Social Distancing. Other jobs have close proximity, such as many production jobs, but do not require worker to worker contact. In many of these jobs, workers already wear protective gear, so the addition of additional protective gear might dramatically lessen the risk of Covid-19 exposure, without reducing worker effectiveness. These jobs likely won't face a negative demand shock from Social Distancing.

Other occupations have industrial exposure unrelated to their tasks. For example, a reservation agent for a travel company may have only telephonic contact with customers and other employees, but demand for that industry's services is likely to be shocked by extreme Social Distancing.

This approach requires some assumptions. We only include occupations in the top half of either work context of "work with others" or "physical proximity with others" in the O*NET data. We exclude from this list primarily public sector occupations, such as secondary school teachers and university professors. We do so in the expectation that

these workers will largely remain employed, even if work conditions vary dramatically. This yields roughly 116 occupations out of more than 1,300 US 6-Digit OES occupations. Of these, 69 are in medical and health care fields. We exclude these as well, though some of these occupations, such as Athletic Trainers may experience significant negative labor demand shocks. In general, it seems uncontroversial to assume the response to Covid-19 is likely to be one of positive labor demand shock for healthcare and medical service providers. This analysis is concerned with negative labor demand shocks.

To this list we add occupations that are easily recognizable in affected industries, regardless of their work context. This would include short order cooks, dishwashers, and travel agents, as examples. This process misses related workers in those industries, such as accountants or bookkeepers in a restaurant, or facility maintenance workers in an airline or bus terminal. These are clearly assumptions, but they are conservative and appear to us readily defensible. We report these occupations in the following tables.

Table 1. Management and Restaurant Employees most at risk from Social Distancing

OES Code	Occupational Title	Total Employment	Annual Mean Salary (2018)
11-9051	Food Service Managers	219,160	$58,960
11-9071	Gaming Managers	4,300	85,260
11-9081	Lodging Managers	37,050	62,270
35-1011	Chefs and Head Cooks	128,600	52,160
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	964,400	36,190
35-2011	Cooks, Fast Food	487,510	22,650
35-2012	Cooks, Institution and Cafeteria	400,320	28,290
35-2014	Cooks, Restaurant	1,340,810	27,580
35-2015	Cooks, Short Order	155,840	25,140
35-2021	Food Preparation Workers	814,600	24,830
35-3011	Bartenders	631,480	26,780
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	3,676,180	22,140
35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	473,860	23,240
35-3031	Waiters and Waitresses	2,582,410	25,830
35-3041	Food Servers, Nonrestaurant	266,190	24,980
35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	455,700	23,950
35-9021	Dishwashers	504,770	23,190
35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	416,950	23,260

Table 2. Transportation and Retail Employees most at risk from Social Distancing

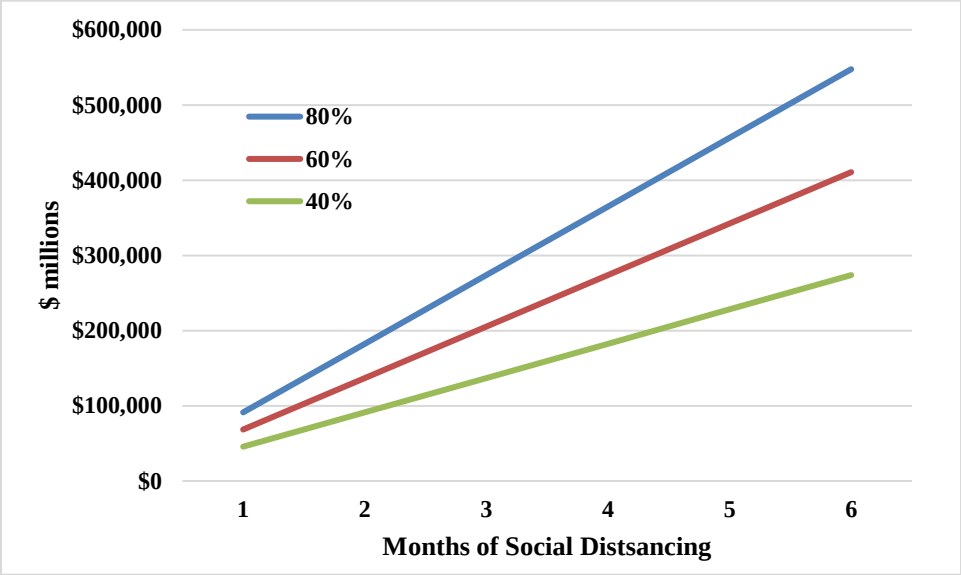
OES Code	Occupational Title	Total Employment	Annual Mean Salary (2018)
41-1011	First-Line Supervisors of Retail Sales Workers	1,181,530	45,080
41-1012	First-Line Supervisors of Non-Retail Sales Workers	247,570	84,600
41-2011	Cashiers	3,635,550	23,240
41-2012	Gaming Change Persons and Booth Cashiers	22,020	27,220
41-2021	Counter and Rental Clerks	426,700	31,200
41-2022	Parts Salespersons	254,870	34,080
41-2031	Retail Salespersons	4,448,120	28,310
41-3011	Advertising Sales Agents	133,110	63,360
41-3021	Insurance Sales Agents	393,830	67,890
41-3041	Travel Agents	69,480	42,720
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	312,980	91,830
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1,350,180	69,480
41-9011	Demonstrators and Product Promoters	81,250	33,260
41-9012	Models	3,310	31,570
41-9021	Real Estate Brokers	40,320	78,940
41-9022	Real Estate Sales Agents	156,760	61,720
41-9031	Sales Engineers	65,720	108,610
41-9041	Telemarketers	164,160	28,550
41-9091	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers	9,430	34,120
53-2011	Airline Pilots, Copilots, and Flight Engineers	82,890	169,560
53-2012	Commercial Pilots	37,870	96,530
53-2021	Air Traffic Controllers	22,390	120,830
53-2022	Airfield Operations Specialists	9,960	56,760
53-2031	Flight Attendants	118,770	56,630
53-3021	Bus Drivers, Transit and Intercity	174,110	44,650
53-3022	Bus Drivers, School or Special Client	504,150	33,390
53-3031	Driver/Sales Workers	414,860	29,610
53-3041	Taxi Drivers and Chauffeurs	207,920	28,450

The resulting sorting process yields 28,129,000 jobs which involve high levels of physical proximity with others and working with others and which pay a weighted average of $32,774 per year. This is roughly 17 percent of US employment, or more than 1 in six workers.

To gauge the magnitude of extreme Social Distancing, we provide a range of estimates of lost earnings for each worker in these occupations. We graphically present lost earnings

over six months, under three scenarios. These are the worst case 80 percent, which mimics the CBO worst case, then reductions of 60 percent and 40 percent across the nation. This could represent lost jobs, reduced hours or some mix of both labor demand effects. This is designed to provide different levels of severity, and account for the possibility that extreme Social Distancing will occur in different locations at different times. We note that extreme social distancing in some locations (e.g. Wuhan Province, China) are now approaching the start of a third month. See Figure 1.

Figure 1, Wage impact across Three Scenarios of Social Distancing



Summary

Social Distancing which involves guidance from the CDC to stay at home or work from home will disproportionately affect works who must be in contact with customers or fellow workers, and who work in close proximity to them. These workers face likely significant negative labor demand shocks. Workers in industries likely avoided by households practicing extreme Social Distancing will likewise face negative labor demand shocks, as restaurants, movie theaters and recreational activities close. In these instances, all workers, not just those who interact with customers and with one another will likely experience negative labor demand shocks.

Our estimates here, using data from O*NET and the OES from the Bureau of Labor Statistics presents a distinct picture. Nearly 1 in 6 jobs in the United States is at risk of significant negative demand shocks. Workers in these occupations are less well paid on average. Though we don't have data available on benefits, it is near certain these workers are in occupations well known to have lower incidence of sick days, stable work hours

and other forms of workplace benefits. This makes staying home from work and accessing medical treatment (or even diagnosis) difficult for infected workers, and given the types of tasks performed by these workers, it is difficult for coworkers to maintain appropriate social distances increasing the transmission of the virus.

We don't include fiscal, broader macroeconomic effects, effects of existing or likely policy interventions (such as Unemployment Insurance or Universal Basic Income), nor do we examine lost proprietor's income, or firm value added production that is lost. We save those for later work.

This study omits several import issues related to Social Distancing. This is not a forecast, but evidence of potential short run effects designed to frame the magnitude of the problem. Future work should incorporate evidence of productivity effects from home work, such as Bloom, Liang, Roberts and Ying (2014), and evaluate the absorption rate of unemployed workers into more heavily regulated high demand sectors (Schumacher, 2002; Gooch and Kahn, 2014).

This study acknowledges that we do not have good previous evidence on the effect of extreme Social Distancing. It has not happened in recent decades across a large share of a nation, for a lengthy period of time. This analysis is among the earlier studies of this phenomenon, and is based on significant assumptions regarding the magnitude of lost wages due to Social Distancing. We cannot predict the duration, or share of jobs lost to prudent disease prevention measures. However, the amount is significant, and warrants immediate public policy concerns for Federal and state policymakers.

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