Contact Hour Pilot Study Design Proposal
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The purpose of this proposal is to develop the key parameters for testing out the Contact Hour (CH) methodology in a series of facilities to determine its efficacy. The pilot will determine if this CH methodology has any merit in being able to be used as a rough estimate to identifying facilities that may be at greater risk to spreading an infectious disease, such as the COVID19 virus. Since monitoring of facilities will not be occurring during the COVID19 pandemic are there ways to measure the research question in the previous sentence. Yes there is and it is based upon the Contact Hour (CH) methodology and involves asking the following seven questions[1]:

1. When does your first teaching staff arrive or when does your facility open?
2. When does your last teaching staff leave or when does your facility close?
   3. Number of teaching/caregiving staff?
3. Number of children on your maximum enrollment day?
   5. When does your last child arrive?
   6. When does your first child leave?
4. Has any child or adult within your facility contracted the COVID19 virus?

After getting the answers to these questions, the following formulae can be used to determine contact hours (CH) based upon the relationship between when the children arrive and leave (TH) and how long the facility is open (TO):

$$(1)\ CH = ((NC(TO+TH))/2)/TA; \quad (2)\ CH = (NC \times TO)/TA; \quad (3)\ CH = ((NC \times TO)/2)/TA; \quad (4)\ CH = (NC^{2)/TA}$$

Where: CH = Contact Hours; NC = Number of Children; TO = Total number of hours the facility is open; TA = Total number of teaching staff, and TH = Total number of hours at full enrollment.

By knowing the number of contact hours (CH) it will be possible to rank order the exposure time of adults with children. This metric could then be used to determine if greater contact hours is correlated with the increased risk of the COVID19 virus. The COVID19 virus question is the dependent variable and is not used in the above formulae.

The following chart can be used by entering the following metrics (example in the table is based upon 5 enrolled children (NC)): the facility is open for 10 hours (TO) and then various scenarios are played out for how long the facility is at full enrollment (TH). Based upon these metrics an outcome rubric can be used where less CH is a positive (+), while high CH is a negative (-). For simplicity, the following chart is based upon one teaching staff (TA) being present (1:5 Adult-Child Ratio). The chart on page 2 provides a more detailed depiction of various CH for a multitude of Adult-Child Ratios and the figure on page 3 shows a hypothesized relationship between CH and COVID19 infection rates.

Contact Hour Score Generated from Above 4 Formulae and Potential Outcomes (COVID19 Infections)

Contact Hours - CH Score	Formulae for CH Score	Potential Outcomes
10	(2 (NC) x 10 (TO)) / 2	+ (None or few COVID19 Infections)
38	(5 (NC) (5 (TH) + 10 (TO)) / 2	+ / - (Lower # of COVID19 Infections)
80	8 (NC) x 10 (TO)	-/ + (Higher # of COVID19 Infections)
100	10 (NC) x 10 (TO)	-(Highest # of COVID19 Infections)

## Contact Hour (CH) Conversion Table (Fiene, 2020©)

The previous chart on page 1 provided a theoretical view of how Contact Hours could be calculated, the following chart provides the addition of the number of staff (TA) in the equation and enhances the Contact Hours metric by calculating a Relatively Weighted Contact Hours (RWCH).

<-------------------- Adult-Child Ratios (Relatively Weighted Contact Hours)   -------------->

NC	CH GS	1:1	2:1	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1	13:1	14:1	15:1
1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2	20	10	20	20	20	20	20	20	20	20	20	20	20	20	20	20
3	30	10	15	30	30	30	30	30	30	30	30	30	30	30	30	30
4	40	10	20	20	40	40	40	40	40	40	40	40	40	40	40	40
5	50	10	17	25	25	50	50	50	50	50	50	50	50	50	50	50
6	60	10	20	30	30	30	60	60	60	60	60	60	60	60	60	60
7	70	10	18	23	35	35	35	70	70	70	70	70	70	70	70	70
8	80	10	20	27	40	40	40	40	80	80	80	80	80	80	80	80
9	90	10	18	30	30	45	45	45	45	90	90	90	90	90	90	90
10	100	10	20	25	33	50	50	50	50	50	100	100	100	100	100	100
11	110	10	22	28	37	37	55	55	55	55	55	110	110	110	110	110
12	120	10	20	30	40	40	60	60	60	60	60	60	120	120	120	120
13	130	10	22	26	33	43	43	65	65	65	65	65	65	130	130	130
14	140	10	20	28	35	47	47	70	70	70	70	70	70	70	140	140
15	150	10	21	30	38	50	50	50	75	75	75	75	75	75	75	150
16	160	10	20	27	40	40	53	53	80	80	80	80	80	80	80	80
17	170	10	21	28	34	43	57	57	57	85	85	85	85	85	85	85
18	180	10	20	30	36	45	60	60	60	90	90	90	90	90	90	90
19	190	10	21	27	38	48	48	63	63	63	95	95	95	95	95	95
20	200	10	20	29	40	50	50	67	67	67	100	100	100	100	100	100
21	210	10	21	30	35	42	53	70	70	70	70	105	105	105	105	105
22	220	10	20	28	37	44	55	55	73	73	73	110	110	110	110	110
23	230	10	21	29	38	46	58	58	77	77	77	77	115	115	115	115
24	240	10	20	30	40	48	60	60	80	80	80	80	120	120	120	120
25	250	10	21	28	36	50	50	63	63	83	83	83	83	125	125	125
26	260	10	20	29	37	43	52	65	65	87	87	87	87	130	130	130
27	270	10	21	30	39	45	54	68	68	90	90	90	90	90	135	135
28	280	10	20	28	40	47	56	70	70	70	93	93	93	93	140	140
29	290	10	21	29	36	48	58	58	73	73	97	97	97	97	97	145
30	300	10	20	30	38	50	60	60	75	75	75	100	100	100	100	150

This table is based upon the assumptions that the child care is 10 hours in length (TO) and that the full enrollment is present for the full 10 hours (TH). This is unlikely to ever occur but it gives us a reference point to measure adult child contact hours in the most efficient manner.   Based upon the relationship between TO and TH, select from one of the formulae from the previous page (1-4) to determine how well the actual Relatively Weighted Contact Hours (RWCH) match with this table. If the RWCH exceed the respective RWCH in this table, then the facility would be over ratio on ACR and exceed group size standards.

Based upon the above tables classifications, the following figure provides a hypothesized relationship between the various contact hour (CH) levels of blue, green, yellow, and red and the ranges these color schemes represent as per COVID19 infections.

Contact Hour (CH) Levels and COVID19 Infections
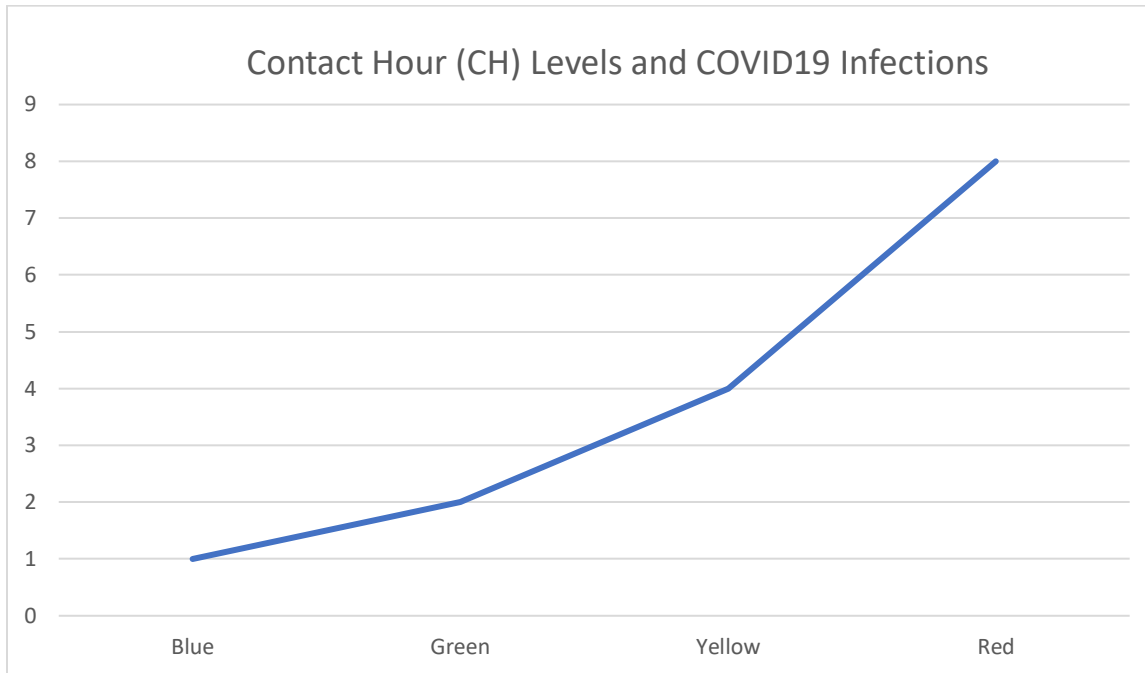
The above figure's hypothesized results projects that as the level of Contact Hours (CH) increases, a corresponding increase in COVID19 infections in adults and children would also occur in the child care facility starting off slowly at the lowest level of CH (Blue), increasing slightly (Green), but then a steeper curve (Yellow), and steepest at the Red level where CH would be at the highest representing the greatest number of children and adults present over time.

The proposed pilot study will test this hypothesis to determine if this is the case or not[2].

Notes:

1 The seven (7) questions should be asked of each grouping that is defined by a classroom or a well defined group within each classroom tied to a specific adult-child ratio.

2 The results from this pilot study could lead to interesting planning for the future in which a particular threshold could be identified where the infection rates are too high or where infection rates begin.

Additional information regarding this methodology can be obtained from contacting: Dr Richard Fiene, Research Psychologist, Research Institute for Key Indicators, & Penn State University. RFiene@RIKInstitute.com or RJF8@psu.edu. http://RIKInstitute.com