Calculating and Applying the Contact Hour (CH) Metric: A Template for Child Care Center Monitoring

1.0 Introduction to the Contact Hour (CH) Metric

This document serves as a practical template for child care providers and regulators to calculate and interpret the Contact Hour (CH) metric. The CH metric is a powerful statistical methodology for monitoring health and safety risks remotely, without the need for initial on-site observations. It provides a simple yet effective way to quantify the density of contact between adults and children over time, offering valuable insights into regulatory compliance and potential risk levels for the spread of infectious disease or injury.

The Contact Hour metric has evolved significantly since its inception. Its journey highlights its adaptability as a monitoring tool for various public health and safety concerns in child care settings.

- **1979 Proposal:** The metric was originally proposed as an efficient methodology for monitoring compliance with the Federal Interagency Day Care Requirements (FIDCR), specifically for staff-child ratios. Its ability to function without on-site observation was a key advantage. However, the FIDCR was rescinded in 1980, and the metric was never implemented on a large scale.
- **2020 Revival:** After lying dormant for 40 years, the CH metric became relevant again during the 2020 COVID-19 pandemic. The need for virtual monitoring led to its pilot testing in Washington State, where it proved to be a successful mathematical model for determining potential virus exposure rates.
- **Current Application:** It is now being proposed that the Contact Hour metric may potentially serve as a monitoring tool for child injury and illness data. Because research suggests a relationship between facility size and injury rates, the metric could offer a standardized way to measure this relationship. However, this application remains hypothetical and requires a large-scale study to determine its efficacy.

This document will now transition to the practical steps of data collection and calculation required to effectively use this model.

2.0 The Calculation Template: A Step-by-Step Guide

The foundation of the Contact Hour metric is a simple, straightforward mathematical model built from the answers to six critical operational questions. By gathering this core data, a facility can construct a clear picture of its contact density. This section provides the direct inputs and formulas needed to calculate a Relatively Weighted Contact Hour (RWCH) score for a specific classroom or well-defined group.

2.1 Step 1: Gather Your Facility's Core Data

To begin, answer the following six questions for a specific classroom or well-defined group on its maximum enrollment day.

1. When does your first teaching staff arrive or when does your facility open **(TO1)**?
2. When does your last teaching staff leave or when does your facility close **(TO2)**?
3. Number of teaching/caregiving staff **(TA)**?
4. Number of children on your maximum enrollment day **(NC)**?
5. When does your last child arrive **(TH1)**?
6. When does your first child leave **(TH2)**?

2.2 Step 2: Define the Calculation Variables

The answers from Step 1 are used to define the variables in the RWCH formulas. The following table provides a clear definition for each variable.

Variable	Definition
NC	Number of Children on maximum enrollment day.
TA	Total number of teaching staff.
ACR	Adult-Child Ratio (The target ratio of staff to children your facility aims to maintain).

TO	Total number of hours the facility is open (Calculated as TO2 - TO1).
TH	Total number of hours at full enrollment (Calculated as TH2 - TH1).
RWCH	Relatively Weighted Contact Hours (The final calculated score, adjusted for teaching staff).

2.3 Step 3: Select the Appropriate Calculation Model and Formula

The specific formula used to calculate your RWCH score depends on the relationship between TO (Total hours open) and TH (Hours at full enrollment). This relationship reflects different "density distributions," which describe how children are present over the course of the day. The two primary models are the Reference Standard (RS) Model and the Trapezoid/Triangle (TT) Model.

The TT model represents the most common operational scenarios where children arrive and depart gradually. This creates a trapezoidal or triangular shape when attendance is plotted over time. The RS model represents a less common but more efficient scenario where all children are present for a solid block of time, creating a rectangular shape. The choice of model is critical for accurately reflecting your facility's attendance patterns.

- **The RS (Reference Standard) Model:** Use this model for scenarios where full enrollment is maintained for the entire duration the facility is open.
    - If TO = TH = NC (e.g., 8 hours open, 8 hours full, 8 children), use Formula: RWCH = (NC x TO) / TA
    - If TO = TH < NC (e.g., 8 hours open, 8 hours full, 10 children), use Formula: RWCH = (NC x TH) / TA
    - If TO = TH > NC (e.g., 10 hours open, 10 hours full, 8 children—a highly improbable scenario), use Formula: RWCH = (NC x TO) / TA
- **The TT (Trapezoid/Triangle) Model:** Use this model for more common scenarios where children arrive and depart gradually.
    - If TH < TO, use Formula: RWCH = ((NC (TO + TH)) / 2) / TA
    - If TH = 0 (meaning the last child arrives as the first child leaves), use Formula: RWCH = ((NC x TO) / 2) / TA

An alternative formula is included in the original methodology for completeness. However, the primary decision for users is between the RS and TT models based on facility attendance patterns: RWCH = (NC2) / TA

Once you have calculated your RWCH score using the appropriate formula, the next step is to interpret this score to gain actionable insights.

3.0 Interpreting Your Results: From RWCH Score to Actionable Insight

Obtaining a raw RWCH score is just the first step. The true value of the metric comes from comparing this score to established benchmarks to assess regulatory compliance and potential health and safety risks. This section will guide you through that interpretation process.

3.1 Using the Benchmark Table to Evaluate Your RWCH

The formulas in Section 2.3 produce your facility's actual **Relatively Weighted Contact Hours (RWCH)** score. This score must be compared against a standardized benchmark to determine compliance. The table below provides these benchmark scores for various numbers of children and Adult-Child Ratios (ACRs), based on a highly efficient, 8-hour reference day.

This table represents a standardized benchmark. You will calculate your facility's actual RWCH using your specific operational hours (TO) and full-enrollment hours (TH) and then compare that number against the corresponding value for your Number of Children (NC) and target Adult-Child Ratio (ACR) in this table.

Table 1: Benchmark RWCH Scores for Regulatory Compliance (Based on RS Model, 8-Hour Day)

NC	CH	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	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2	16	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16

3	24	8	12	24	24	24	24	24	24	24	24	24	24	24	24	24
4	32	8	16	16	32	32	32	32	32	32	32	32	32	32	32	32
5	40	8	13	20	20	40	40	40	40	40	40	40	40	40	40	40
6	48	8	16	24	24	24	48	48	48	48	48	48	48	48	48	48
7	56	8	14	19	28	28	28	56	56	56	56	56	56	56	56	56
8	64	8	16	21	32	32	32	32	64	64	64	64	64	64	64	64
9	72	8	14	24	24	36	36	36	36	72	72	72	72	72	72	72
10	80	8	16	20	27	40	40	40	40	40	80	80	80	80	80	80
11	88	8	15	22	29	29	44	44	44	44	44	88	88	88	88	88
12	96	8	16	24	32	32	48	48	48	48	48	48	96	96	96	96
13	104	8	15	21	26	35	35	52	52	52	52	52	52	104	104	104
14	112	8	16	22	28	37	37	56	56	56	56	56	56	56	112	112
15	120	8	15	24	30	40	40	40	60	60	60	60	60	60	60	120
16	128	8	16	21	32	32	43	43	64	64	64	64	64	64	64	64
17	136	8	15	23	27	34	45	45	45	68	68	68	68	68	68	68
18	144	8	16	24	29	36	48	48	48	72	72	72	72	72	72	72
19	152	8	15	22	30	38	38	51	51	51	76	76	76	76	76	76
20	160	8	16	23	32	40	40	53	53	53	80	80	80	80	80	80

21	168	8	15	24	28	34	42	56	56	56	56	84	84	84	84	84
22	176	8	16	22	29	35	44	44	59	59	59	88	88	88	88	88
23	184	8	15	23	31	37	46	46	61	61	61	61	92	92	92	92
24	192	8	16	24	32	38	48	48	64	64	64	64	96	96	96	96
25	200	8	15	22	29	40	40	50	50	67	67	67	67	100	100	100
26	208	8	16	23	30	35	42	52	52	69	69	69	69	104	104	104
27	216	8	15	24	31	36	43	54	54	72	72	72	72	72	108	108
28	224	8	16	22	32	37	45	56	56	56	75	75	75	75	112	112
29	232	8	15	23	29	39	46	46	58	58	77	77	77	77	77	116
30	240	8	16	24	30	40	48	48	60	60	80	80	80	80	80	120

Note: This table uses an 8-hour day as the reference standard. Other benchmarks can be developed for different standard operating schedules (e.g., 10-hour days).

3.2 Evaluating Regulatory Compliance and Risk

The significance of the RWCH score lies in its comparison to the benchmark values in Table 1. If your facility's calculated RWCH **exceeds** the benchmark RWCH value listed in the table for your Number of Children (NC) and target Adult-Child Ratio (ACR), the facility is considered "over ratio" or "overpopulated." This indicates potential non-compliance with ratio standards and a higher density of contact.

Based on data from the pilot validation in Washington State, this score can be used to classify risk, particularly concerning the spread of infectious diseases.

Risk Level	Description
Blue	Significantly under required ACRs. Represents the lowest potential for virus spread.
Green	Meets or is under the required Adult-Child Ratios (ACRs). The potential spread of a virus is mitigated most greatly.
Yellow	A mix of meeting, being under, and being over required ACRs. Represents a transitional risk level.
Red	Over the required ACRs. Represents the highest risk, placing adults and children at greater potential for infection spread.

The key finding from the Washington State pilot was that a higher RWCH score—representing more concentrated contact between staff and a larger number of children over time—correlates with an increased probability of infection rates. This evidence demonstrates how the methodology can be used to predict appropriate child-to-adult ratios during an outbreak and identify safety thresholds in licensed facilities.

These insights pave the way for potential future enhancements to the model to make it even more robust.

4.0 Limitations and Future Directions

While the Contact Hour metric is a validated, reliable, and powerful screening tool, it is essential to understand its limitations and potential future applications to use it responsibly and effectively. The model is designed to enhance, not replace, existing regulatory practices.

Key Considerations for Use

- **Screening Tool Only:** This methodology is intended as a screening tool to help agencies target limited on-site observational visits more effectively. It should **not** be used as a substitute for on-site inspections when they are possible.

- **Statistical Probability:** The results are based on statistical probabilities that have proven highly reliable and valid in pilot testing, but they are not foolproof. Any cases where there is doubt warrant a direct, follow-up observational inspection.
- **Contextual Data:** To refine results, agencies should consider using the CH methodology in conjunction with other relevant information, such as medical and geographical outbreak data, given the unique nature of various infectious diseases.

Future Evolution: A 3-D Model with Square Footage

The next level for the CH methodology is to evolve from a two-dimensional model (time and density) to a three-dimensional one by incorporating the physical space of the facility. By adding the square footage (SQFT) of a classroom or center, the model can account for physical distancing, which can mitigate the risk associated with increased Contact Hours. The revised formulas incorporating this third dimension are as follows:

- CH2 = (((NC (TO + TH)) / 2) / TA) / (SQFT)
- CH2 = ((NC x TO) / TA) / (SQFT)
- CH2 = (((NC x TO) / 2) / TA) / (SQFT)
- CH2 = ((NC2) / TA) / (SQFT)

In conclusion, the Contact Hour metric offers a dynamic, efficient, and effective methodology for enhancing child safety and health monitoring. By providing a clear, data-driven approach to assessing contact density, it empowers providers and regulators to make more informed decisions that protect the well-being of children in care.