DATA CHALLENGE: RESEARCH QUESTION

BHI-BSN 2018 Data Challenge,
Las Vegas, NV

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Are patients admitted to the intensive care unit on a weekend more likely to die in the hospital than those admitted on a weekday?

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We did leave it intentionally vague, but let's go through it in a little more detail.

PICOT (FRAMING YOUR RESEARCH QUESTION)

Population

Intervention (Exposure)

Confounders

Outcome

Time

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Are <u>patients admitted to the intensive care unit</u> on a <u>weekend</u> more likely to <u>die in the hospital</u> than those admitted on a weekday?

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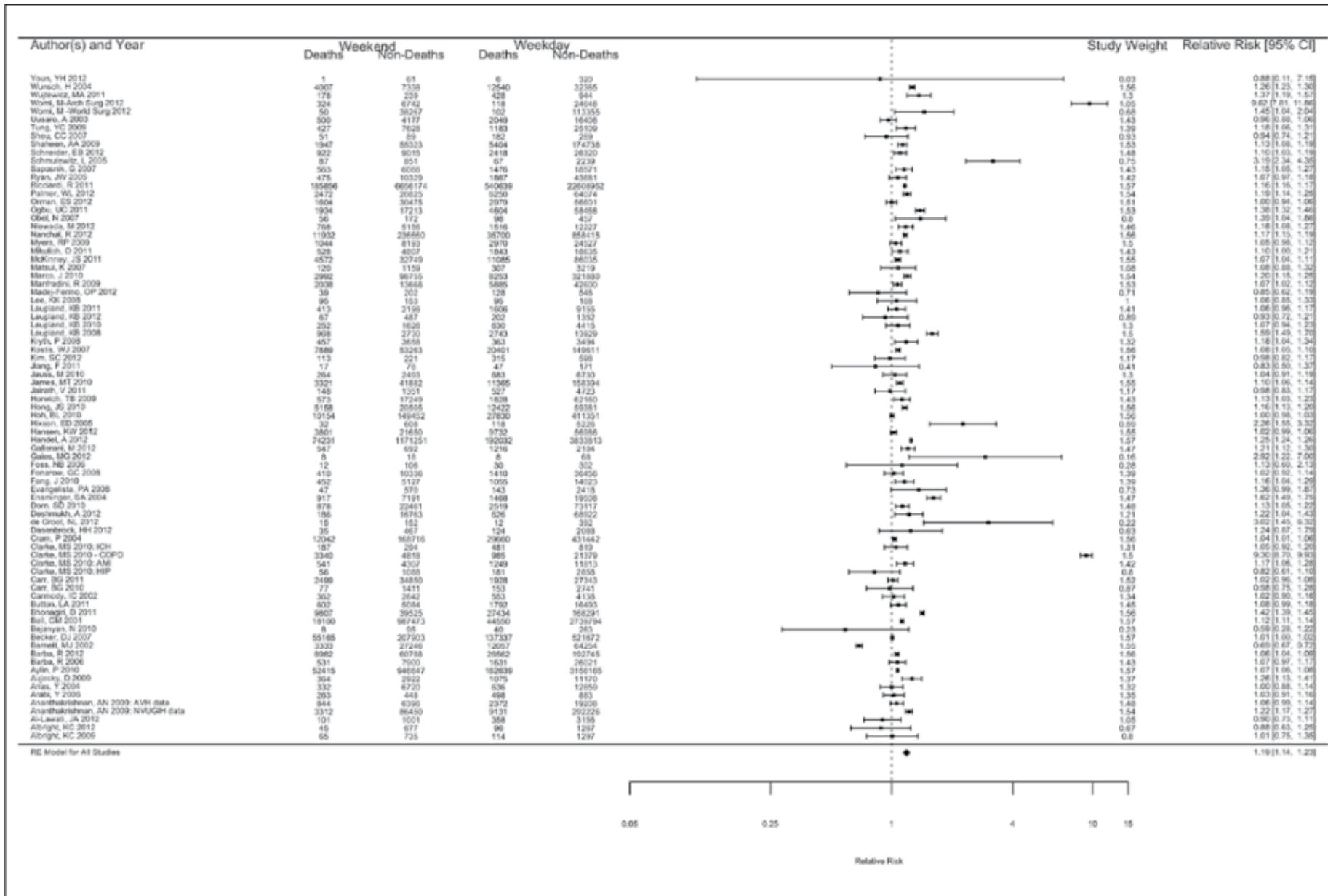
BRIEF LITERATURE REVIEW

Topic has been studied extensively:

- Inpatient Hospital Stays
- Critical Care setting

Studies tended to focus on:

- Staffing levels / Type of Staff
- Disease Severity

As cause of the effect of weekend admission on Mortality Outcomes

FIG 2. Pooled estimate for mortality between weekend and weekday patients. Patients who were admitted or cared for on the weekends had a significantly higher relative risk (RR) for mortality compared to those admitted or cared for on weekdays (RR, 1.19; 95% confidence interval, 1.14-1.23).

		Odds	%
Author	Year	Ratio (95% CI)	Weight
Barnett	2002	1.09 (1.04, 1.15)	63.66
Uusaro	2003	1.20 (1.01, 1.43)	5.32
Ensminger	2004	1.06 (0.96, 1.18)	14.83
Sheu	2007	0.79 (0.50, 1.25)	0.77
Laupland	2008	1.05 (0.95, 1.17)	14.83
Lee	2008	1.03 (0.61, 1.73)	0.59
Overall (I-squared = 0.0%, p = 0.585)		1.08 (1.04, 1.13)	100.00

NOTE: Weights are from random effects analysis
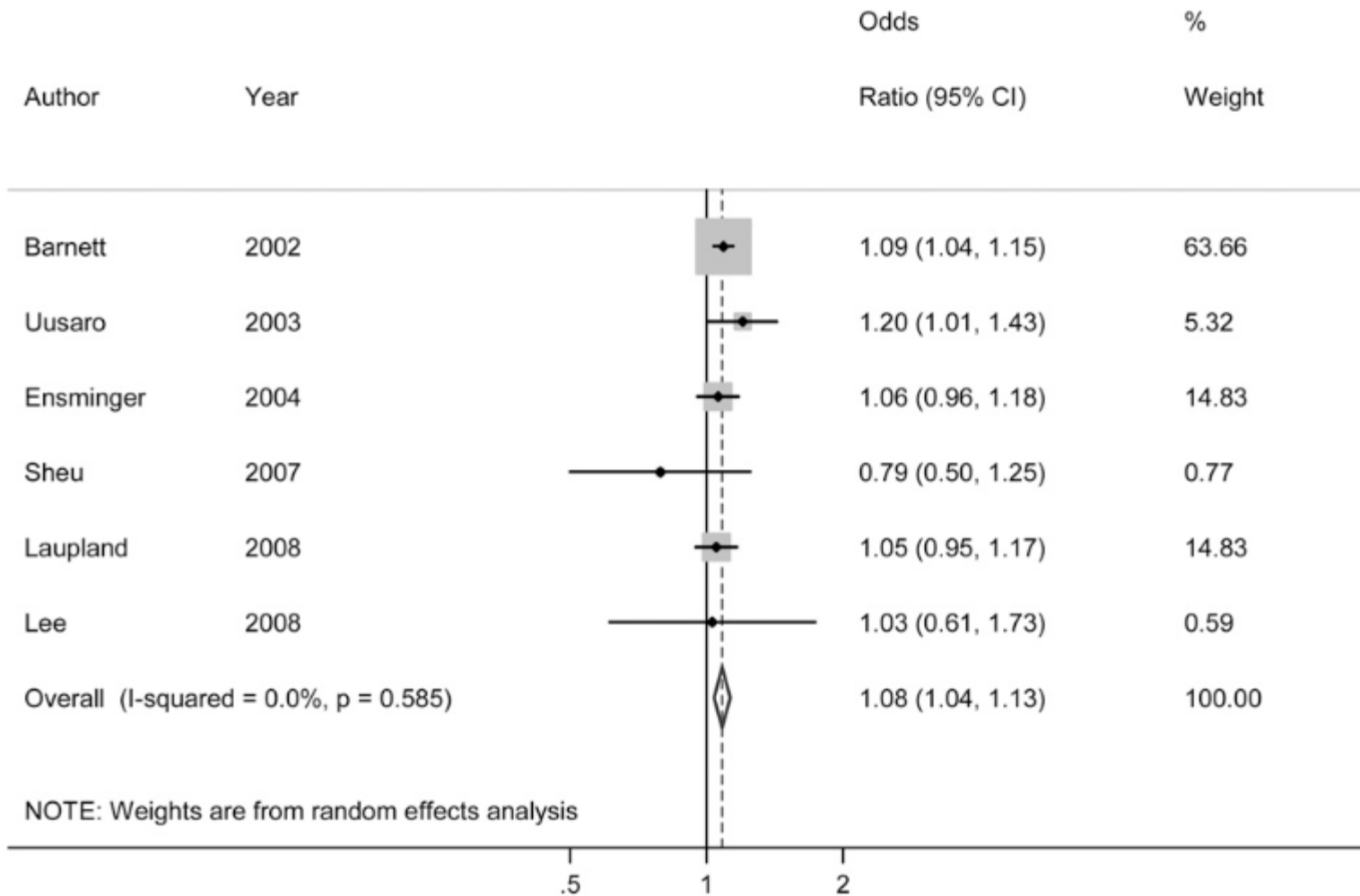
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FIGURE 3. Adjusted effect of weekend admission to the ICU on mortality. Weight is the relative contribution of each study to the overall OR (random effects model with 95% CI). See Figure 1 legend for expansion of abbreviation.

Cavallazzi R, et al, Association Between Time of Admission to the ICU and Mortality: A systematic review and metaanalysis, Chest, 2010, 138(1): 75.
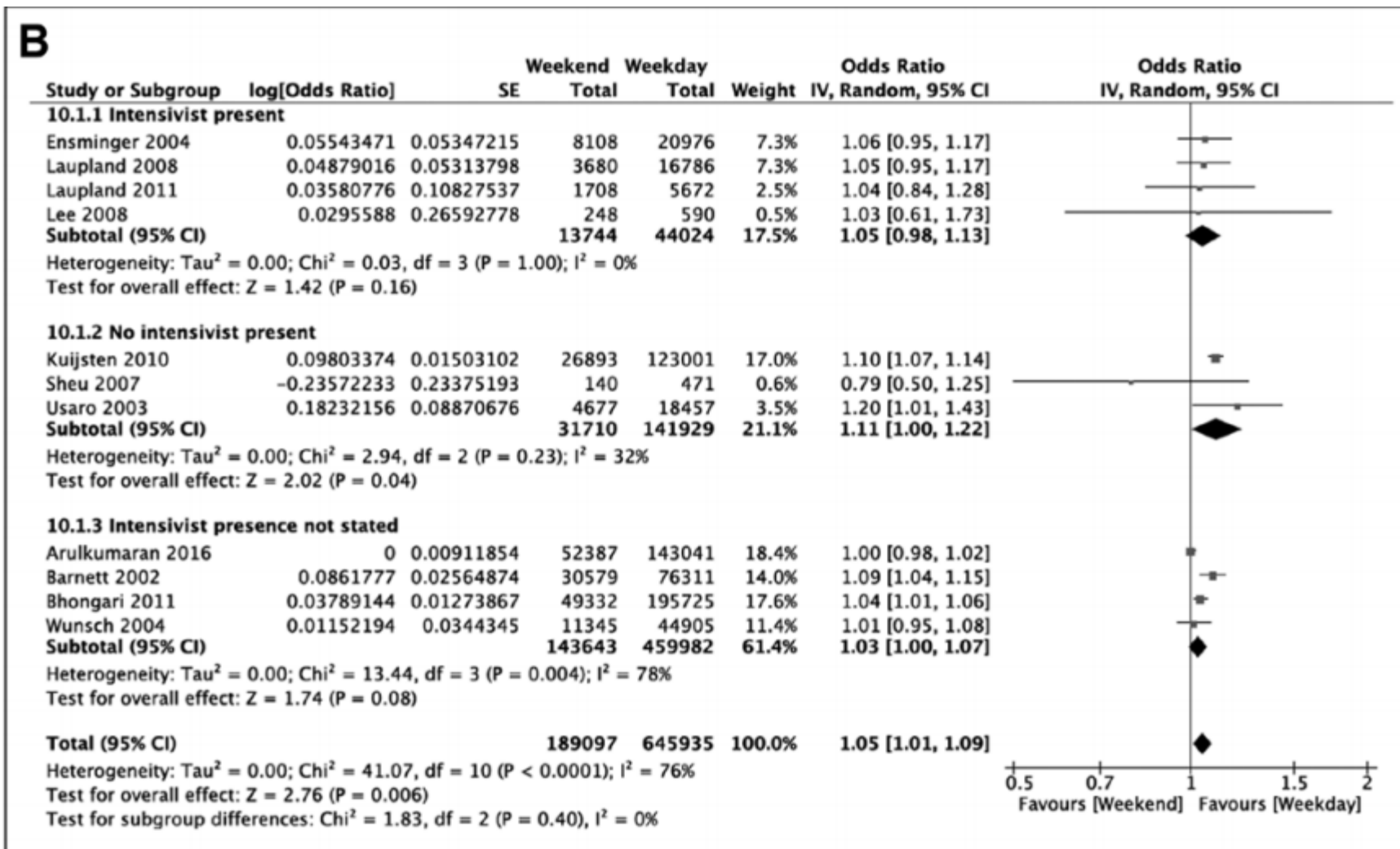
B

Study or Subgroup	log[Odds Ratio]	SE	Weekend Total	Weekday Total	Weight	Odds Ratio IV, Random, 95% CI
10.1.1 Intensivist present						
Ensminger 2004	0.05543471	0.05347215	8108	20976	7.3%	1.06 [0.95, 1.17]
Laupland 2008	0.04879016	0.05313798	3680	16786	7.3%	1.05 [0.95, 1.17]
Laupland 2011	0.03580776	0.10827537	1708	5672	2.5%	1.04 [0.84, 1.28]
Lee 2008	0.0295588	0.26592778	248	590	0.5%	1.03 [0.61, 1.73]
Subtotal (95% CI)			13744	44024	17.5%	1.05 [0.98, 1.13]
Heterogeneity: Tau² = 0.00; Chi² = 0.03, df = 3 (P = 1.00); I² = 0%						
Test for overall effect: Z = 1.42 (P = 0.16)						
10.1.2 No intensivist present						
Kuijsten 2010	0.09803374	0.01503102	26893	123001	17.0%	1.10 [1.07, 1.14]
Sheu 2007	-0.23572233	0.23375193	140	471	0.6%	0.79 [0.50, 1.25]
Usaro 2003	0.18232156	0.08870676	4677	18457	3.5%	1.20 [1.01, 1.43]
Subtotal (95% CI)			31710	141929	21.1%	1.11 [1.00, 1.22]
Heterogeneity: Tau² = 0.00; Chi² = 2.94, df = 2 (P = 0.23); I² = 32%						
Test for overall effect: Z = 2.02 (P = 0.04)						
10.1.3 Intensivist presence not stated						
Arulkumaran 2016	0	0.00911854	52387	143041	18.4%	1.00 [0.98, 1.02]
Barnett 2002	0.0861777	0.02564874	30579	76311	14.0%	1.09 [1.04, 1.15]
Bhongari 2011	0.03789144	0.01273867	49332	195725	17.6%	1.04 [1.01, 1.06]
Wunsch 2004	0.01152194	0.0344345	11345	44905	11.4%	1.01 [0.95, 1.08]
Subtotal (95% CI)			143643	459982	61.4%	1.03 [1.00, 1.07]
Heterogeneity: Tau² = 0.00; Chi² = 13.44, df = 3 (P = 0.004); I² = 78%						
Test for overall effect: Z = 1.74 (P = 0.08)						
Total (95% CI)			189097	645935	100.0%	1.05 [1.01, 1.09]
Heterogeneity: Tau² = 0.00; Chi² = 41.07, df = 10 (P < 0.0001); I² = 76%						
Test for overall effect: Z = 2.76 (P = 0.006)						
Test for subgroup differences: Chi² = 1.83, df = 2 (P = 0.40), I² = 0%						

Odds Ratio scale: 0.5 0.7 1 1.5 2
Favours [Weekend] Favours [Weekday]

Figure 3. A, Adjusted effect of nighttime admission to the ICU on mortality by night time intensivist staffing. Weight is the relative contribution of each study to the overall odds ratio (OR) (random-effects model with 95% CI). **B**, Adjusted effect of day of week admission to the ICU on mortality by night time intensivist staffing. Weight is the relative contribution of each study to the overall OR (random-effects model with 95% CI). *df* = degrees of freedom.

Galloway et al, The Effect of ICU Out-of-Hours Admission on Mortality: A Systematic Review and Meta-Analysis Critical Care Medicine, 2018, 46(2): 290-9.

CHALLENGES

1. Heterogeneity of results

   Large variation in the estimated effects, why?

2. Inconsistent definition of weekend

   Are Friday nights a weekend?

3. Unclear explanation of the cause

   If due to staffing differences, shouldn't night admissions exhibit a similar behavior (they don't).

APPROX. STAFFING IN THE MICU AT BIDMC

Staffing	Weekday (Day)	Weekend (Day)	Anyday (Night)
Attendings	3	3	1
Residents	9	5	5
Resource Nurses	3-5	0	0

YOUR TURN

Now is your chance to weigh in on this.

Some advice:

1. Try to answer the question.

2. Use methods and technique you are comfortable with and can explain.

3. Be as thorough as you can, but understand we are realistic in what you will be able to accomplish in such a short time.

4. Appreciate that over 97 studies have looked into this question, and this remains a controversial topic with no clear resolution.

5. Trying to understand what the limitations of your approaches are, attempt to address them, but if not possible, acknowledge them.