Impact of harm reduction strategies on mortality from opioid overdose in Palm Beach, US: case-control study

DOCUMENT: SAR-2023-021-MB-v01

From: Felipe Figueiredo **To:** Moses Brainmoh

2023-06-01

TABLE OF CONTENTS

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22
https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	1 / 10

Impact of harm reduction strategies on mortality from opioid overdose in Palm Beach, US: case-control study

Document version

Version	Alterations
01	Initial version

1   ABBREVIATIONS

- CI: confidence interval
- HRS: harm reduction strategy
- MAT: medication assisted treatments
- OD: overdose
- OR: odds ratio
- SD: standard deviation

2   CONTEXT

2.1   Objectives

To assess whether two harm reduction strategies are associated with different mortality prevalence rates in patients admitted for any opioid-related overdose in Palm Beach county, US.

3   METHODS

The data procedures, design and analysis methods used in this report are fully described in the annex document **SAP-2022-038-MB-v02**.

This analysis was performed using statistical software R version 4.3.0.

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

	Version	Year	Page
	1	2023	2 / 10

4   RESULTS

4.1   Study population and follow up

A total of 385 observations were available in the raw data, where individual participants were sampled between 2 and 5 times between 2021-01-01 and 2022-09-28. After applying all inclusion and exclusion criteria defined in the Statistical Analysis Plan, data from 167 participants were included in the analysis (Table 1).

The epidemiological profile of the participant included in the study can be described as male (N = 119), white (N = 148), and unemployed (N = 106). Participants' ages were not available. Table 1 shows how these variables break down by exposure to HRS.

Table 1 Participant demographic characteristics at baseline.

Characteristic	**No**, N = 138	**HCD MAT Referral**, N = 16	**Substance Abuse Facilities**, N = 13
Sex, n (%)			
Female	41 (30%)	6 (38%)	1 (7.7%)
Male	97 (70%)	10 (63%)	12 (92%)
Race, n (%)			
White	122 (88%)	13 (81%)	13 (100%)
Black	11 (8.0%)	3 (19%)	0 (0%)
Other	4 (2.9%)	0 (0%)	0 (0%)
Turki	1 (0.7%)	0 (0%)	0 (0%)
Ethnicity, n (%)			
Hispanic	18 (13%)	1 (6.3%)	2 (15%)
Non-Hispanic	120 (87%)	15 (94%)	11 (85%)
Narcan Discharge, n (%)	11 (9.7%)	3 (20%)	0 (0%)

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	3 / 10

Characteristic	**No**, N = 138	**HCD MAT Referral**, N = 16	**Substance Abuse Facilities**, N = 13
Unknown	25	1	6
Employment, n (%)			
Not Employed	87 (63%)	11 (69%)	8 (62%)
Disabled	9 (6.5%)	0 (0%)	0 (0%)
Employed	30 (22%)	4 (25%)	4 (31%)
Retired	12 (8.7%)	0 (0%)	1 (7.7%)
Student	0 (0%)	1 (6.3%)	0 (0%)

Most participants (83%) were not exposed to any HRS. The overall mortality in the sample was 19%. Figure 1 shows how the number of cases is distributed, stratifying by HRS. Most of the cases (15%) happened to participants without any HRS exposure, but participants that were were referred to substance abuse facilities (3.6%) died at higher rates than those that were referred to MAT strategies (0.6%).

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

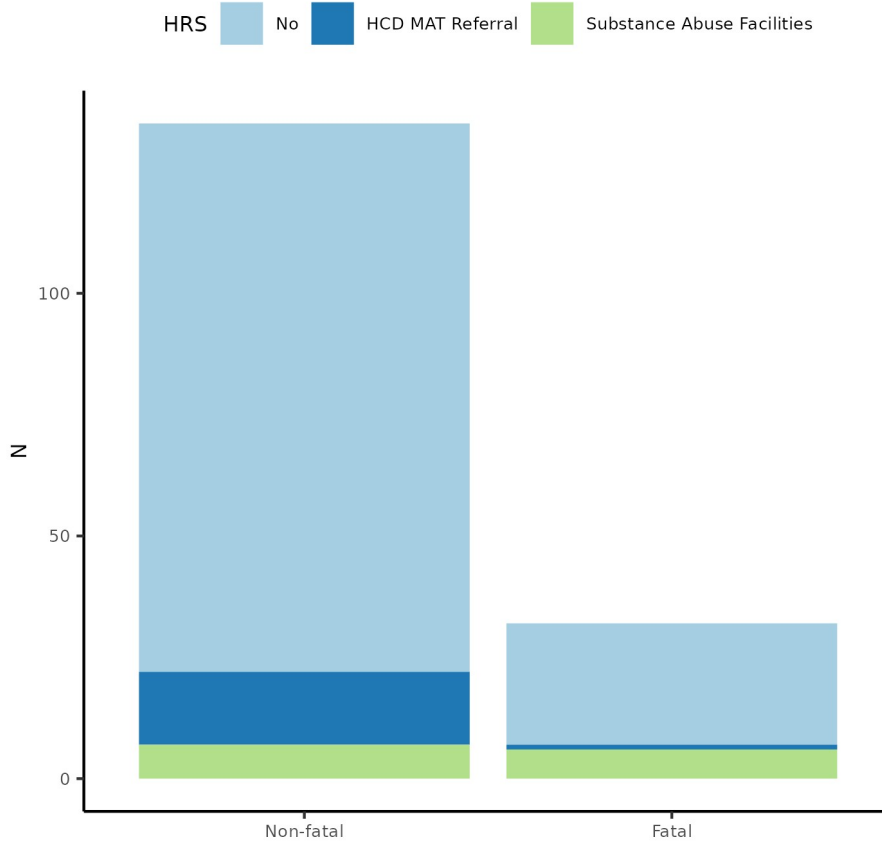| Version	Year	Page
1	2023	4 / 10

Figure 1 *Number of cases by HRS.*

4.2 Association between HRS and mortality

Table 2 shows the odds of dying under each HRS, adjusting for sex, race and employment status.

MAT referral might be a protective intervention, as participants that died were were less likely to have been exposed to this strategy than than participants under no HRS. MAT was associated with 68% lower odds of dying when compared with no HRS, with an OR of 0.32 (95% CI 0.02, 1.74; p=0.285), controlling for sex, race and employment status.

This estimate, however, is not precise. The study sample was not homogeneously represented between exposures (Table 1, Figure 1) and its size not sufficiently large to provide enough power for a precise estimate. This can be seen by how wide the CI is, spanning between protective and harmful effects, so this OR is not statistically significant. Given this uncertainty one cannot be assertive that this HRS is in fact

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	5 / 10

protective, and this estimate should be interpreted with caution. There is no evidence of association between MAT and mortality.

Table 2 *Adjusted odds of mortality by HRS.*

Characteristic	OR[12]	95% CI[12]	p-value[1]
HRS			
No	—	—	
HCD MAT Referral	0.32	0.02 to 1.74	0.285
Substance Abuse Facilities	3.77	1.09 to 12.8	**0.032**

[1]Adjusted by sex, race and employment status

[2]OR = Odds Ratio, CI = Confidence Interval

Substance abuse facilities on the other hand appear to be associated with a higher mortality. Cases were 2.77 times more likely to have been assigned to this intervention, with an OR of 3.77 (95% CI 1.09, 12.8; p=0.032), controlling for sex, race and employment status.

There is much uncertainty in this estimate, with the CI spanning from just 9% higher to 12 times higher rates than those not referred to any HRS. Although the CI is very large this OR is significant and this data shows that the harm associated with this strategy can be consistently detected in this data. There is weak evidence of association between substance abuse facilities and a higher mortality.

5 OBSERVATIONS AND LIMITATIONS

Risk of bias

It is worth noting that the case-control study design cannot attribute the higher mortality to the substance abuse facilities, as any other observational study design.

There is risk of selection bias in this sample, which was not assessed in this analysis. Perhaps the participants that were assigned to this strategy were worse OD cases, or had different socioeconomic characteristics that were not collected for this study, or this association could be spurious and happened by chance.

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	6 / 10

There is also the risk of information bias, since the exposures were not available for cases in the data available. These were imputed for this analysis, as described in the Statistical Analysis Plan.

Recommended reporting guideline

The EQUATOR network reporting guidelines (http://www.equator-network.org/) have seen increasing adoption by scientific journals. All observational studies are recommended to be reported following the STROBE guideline (von Elm et al, 2014).

In particular when a retrospective study is conducted using hospital records, it is recommended that the RECORD extension of the STROBE guideline is considered (Benchimol et al, 2015).

6   CONCLUSIONS

The typical participant included in this study is an unemployed white male that suffered multiple opioid-related OD episodes without being assigned to any HRS.

There is no evidence of association between MAT and mortality.

There is weak evidence of association between substance abuse facilities and a higher mortality. Participants that died were 3 times more likely to have been assigned to this intervention.

7   REFERENCES

- **SAP-2022-038-MB-v02** – Analytical Plan for Impact of harm reduction strategies on mortality from opioid overdose in Palm Beach, US: case-control study
- von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Int J Surg. 2014 Dec;12(12):1495-9 (https://doi.org/10.1016/j.ijsu.2014.07.013).
- Benchimol EI, Smeeth L, Guttmann A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langan SM; RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement. PLoS Med. 2015 Oct 6;12(10):e1001885 (https://doi.org/10.1371/journal.pmed.1001885).
- Van Buuren, S. (2018). Flexible imputation of missing data. CRC press.

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22
https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	7 / 10

8 APPENDIX

8.1 Exploratory data analysis

N/A

8.2 Missing data imputation

Data on the exposure and employment of cases were not available in the raw dataset (Figure A1).
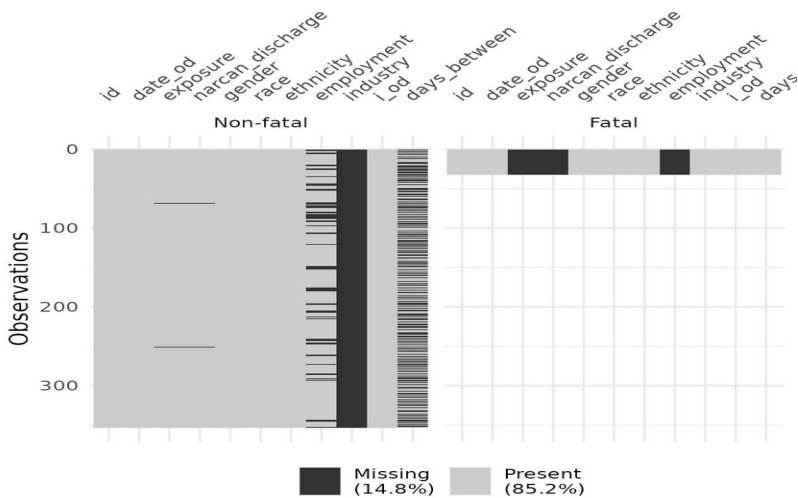
Figure A1 *Missing data in the dataset.*

A Multiple Imputation by Chained Equations algorithm (Van Buuren, 2018) was run on the dataset in the hope of estimating usable imputed values for these variables based on common characteristics from other variables available in the data.

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	8 / 10

8.3 Modeling strategy

Table A1 *Alternative version of Table 1 with the coefficients for all covariates included in the analysis.*

Characteristic	OR[1]	95% CI[1]	p-value
HRS			
No	—	—	
HCD MAT Referral	0.32	0.02 to 1.74	0.285
Substance Abuse Facilities	3.77	1.09 to 12.8	**0.032**
Sex			
Female	—	—	
Male	1.07	0.43 to 2.81	0.893
Race			
White	—	—	
Black	0.84	0.12 to 3.59	0.837
Other	1.01	0.05 to 7.65	0.991
Employment			
Not Employed	—	—	
Retired	1.41	0.41 to 4.30	0.558
Employed	1.50	0.56 to 3.77	0.401

[1]OR = Odds Ratio, CI = Confidence Interval

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22
https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	9 / 10

8.4   Availability

All documents from this consultation were included in the consultant's Portfolio.

The portfolio is available at:

https://philsf-biostat.github.io/SAR-2023-021-MB/

8.5   Associated analyses

This document is part of a larger project and is supported by other documents, linked below.

Analytical Plan for Impact of harm reduction strategies on mortality from opioid overdose in Palm Beach, US: case-control study

https://philsf-biostat.github.io/SAR-2022-038-MB/

8.6   Analytical dataset

Table A2 shows the structure of the analytical dataset.

Table A2 *Analytical dataset structure*

id	exposure	outcome	gender	race	ethnicity	narcan_discharge	employment
1							
2							
3							
…							
N							

Due to confidentiality the data-set used in this analysis cannot be shared online in the public version of this report.

FF Consultoria em Bioestatística e Epidemiologia
CNPJ: 42.154.074/0001-22

https://philsf-biostat.github.io/

SAR

Version	Year	Page
1	2023	10 / 10