The Bias Report

Audit Date: 13 Apr 2019

Data Audited: 7214 rows

Attributes Audited: Unnamed: 0, sex, age_cat, race

Audit Goal(s):

Equal Parity - Ensure all protected groups are have equal representation in the selected set.

Proportional Parity - Ensure all protected groups are selected proportional to their percentage of the population.

False Positive Rate Parity - Ensure all protected groups have the same false positive rates as the reference group).

False Discovery Rate Parity - Ensure all protected groups have equally proportional false positives within the selected set (compared to the reference group).

False Negative Rate Parity - Ensure all protected groups have the same false negative rates (as the reference group).

False Omission Rate Parity - Ensure all protected groups have equally proportional false negatives within the non-selected set (compared to the reference group).

Reference Groups: Majority group - The largest groups on each attribute will be used as baseline to calculate relative disparities in this audit.

Fairness Threshold: 80%. If disparity for a group is within 80% and 125% of the value of the reference group on a group metric (e.g. False Positive Rate), this audit will pass.

Audit Results:

Audit Results: Summary

Equal Parity - Ensure all protected groups are have equal representation in the selected set.	**Failed**	Details
Proportional Parity - Ensure all protected groups are selected proportional to their percentage of the population.	**Failed**	Details

False Positive Rate Parity - Ensure all protected groups have the same false positive rates as the reference group).	**Failed**	Details
False Discovery Rate Parity - Ensure all protected groups have equally proportional false positives within the selected set (compared to the reference group).	**Failed**	Details
False Negative Rate Parity - Ensure all protected groups have the same false negative rates (as the reference group).	**Failed**	Details
False Omission Rate Parity - Ensure all protected groups have equally proportional false negatives within the non-selected set (compared to the reference group).	**Failed**	Details

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Audit Results: Details by Fairness Measures

Equal Parity: Failed

What is it?

This criteria considers an attribute to have equal parity is every group is equally represented in the selected set. For example, if race (with possible values of white, black, other) has equal parity, it implies that all three races are equally represented (33% each)in the selected/intervention set.

When does it matter?

If your desired outcome is to intervene equally on people from all races, then you care about this criteria.

Which groups failed the audit:

For sex (with reference group as **Male**)
Female with **0.15X** Disparity

For age_cat (with reference group as **25 - 45**)
Greater than 45 with **0.16X** Disparity
Less than 25 with **0.55X** Disparity

For race (with reference group as **African-American**)
Hispanic with **0.07X** Disparity
Other with **0.03X** Disparity
Caucasian with **0.28X** Disparity
Native American with **0.01X** Disparity
Asian with **0.00X** Disparity

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Proportional Parity: Failed

What is it?	When does it matter?	Which groups failed the audit:
This criteria considers an attribute to have proportional parity if every group is represented proportionally to their share of the population. For example, if race with possible values of white, black, other being 50%, 30%, 20% of the population respectively) has proportional parity, it implies that all three races are represented in the same proportions (50%, 30%, 20%) in the selected set.	If your desired outcome is to intervene proportionally on people from all races, then you care about this criteria.	**For sex** (with reference group as **Male**) Female with **0.64X** Disparity **For age_cat** (with reference group as **25 - 45**) Greater than 45 with **0.41X** Disparity Less than 25 with **1.48X** Disparity **For race** (with reference group as **African-American**) Hispanic with **0.40X** Disparity Other with **0.25X** Disparity Caucasian with **0.42X** Disparity Asian with **0.33X** Disparity

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False Positive Rate Parity: Failed

What is it?	When does it matter?	Which groups failed the audit:

This criteria considers an attribute to have False Positive parity if every group has the same False Positive Error Rate. For example, if race has false positive parity, it implies that all three races have the same False Positive Error Rate.

If your desired outcome is to make false positive errors equally on people from all races, then you care about this criteria. This is important in cases where your intervention is punitive and has a risk of adverse outcomes for individuals. Using this criteria allows you to make sure that you are not making false positive mistakes about any single group disproportionately.

For sex (with reference group as **Male**)
Female with **0.74X** Disparity

For age_cat (with reference group as **25 - 45**)
Less than 25 with **1.71X** Disparity
Greater than 45 with **0.42X** Disparity

For race (with reference group as **African-American**)
Other with **0.15X** Disparity
Native American with **0.78X** Disparity
Hispanic with **0.48X** Disparity
Asian with **0.27X** Disparity
Caucasian with **0.36X** Disparity

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False Discovery Rate Parity: Failed

What is it?

This criteria considers an attribute to have False Discovery Rate parity if every group has the same False Discovery Error Rate. For example, if race has false discovery parity, it implies that all three races have the same False Discvery Error Rate.

When does it matter?

If your desired outcome is to make false positive errors equally on people from all races, then you care about this criteria. This is important in cases where your intervention is punitive and can hurt individuals and where you are selecting a very small group for interventions.

Which groups failed the audit:

For sex (with reference group as **Male**)
Female with **1.40X** Disparity

For age_cat (with reference group as **25 - 45**)
Greater than 45 with **1.31X** Disparity

For race (with reference group as **African-American**)
Hispanic with **1.56X** Disparity
Native American with **0.61X** Disparity

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False Negative Rate Parity: Failed

What is it?	When does it matter?	Which groups failed the audit:
This criteria considers an attribute to have False Negative parity if every group has the same False Negative Error Rate. For example, if race has false negative parity, it implies that all three races have the same False Negative Error Rate.	If your desired outcome is to make false negative errors equally on people from all races, then you care about this criteria. This is important in cases where your intervention is assistive (providing helpful social services for example) and missing an individual could lead to adverse outcomes for them. Using this criteria allows you to make sure that you're not missing people from certain groups disproportionately.	**For race** (with reference group as **African-American**) Other with **1.40X** Disparity Caucasian with **1.31X** Disparity Asian with **1.29X** Disparity Hispanic with **1.37X** Disparity

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False Omission Rate Parity: Failed

What is it?	When does it matter?	Which groups failed the audit:
This criteria considers an attribute to have False Omission Rate parity if every group has the same False Omission Error Rate. For example, if race has false omission parity, it implies that all three races have the same False Omission Error Rate.	If your desired outcome is to make false negative errors equally on people from all races, then you care about this criteria. This is important in cases where your intervention is assistive (providing help social services for example) and missing an individual could lead to adverse outcomes for them , and where you are selecting a very small group for interventions. Using this criteria allows you to make sure that you're not missing people from certain groups disproportionately.	**For sex** (with reference group as **Male**) Female with **0.78X** Disparity **For age_cat** (with reference group as **25 - 45**) Greater than 45 with **0.73X** Disparity **For race** (with reference group as **African-American**) Asian with **0.56X** Disparity Hispanic with **0.78X** Disparity Other with **0.74X** Disparity

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Audit Results: Details by Protected Attributes

Unnamed: 0

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
0.00-1803.25	Ref	Ref	Ref	Ref	Ref	Ref
1803.25-3606.50	Passed	Passed	Passed	Passed	Passed	Passed
3606.50-5409.75	Passed	Passed	Passed	Passed	Passed	Passed
5409.75-7213.00	Passed	Passed	Passed	Passed	Passed	Passed

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sex

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
Female	Failed	Failed	Failed	Failed	Failed	Passed
Male	Ref	Ref	Ref	Ref	Ref	Ref

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age_cat

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
25 - 45	Ref	Ref	Ref	Ref	Ref	Ref
Greater than 45	Failed	Failed	Failed	Failed	Failed	Passed
Less than 25	Failed	Failed	Passed	Failed	Passed	Passed

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race

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
African-American	Ref	Ref	Ref	Ref	Ref	Ref
Asian	Failed	Failed	Passed	Failed	Failed	Failed
Caucasian	Failed	Failed	Passed	Failed	Passed	Failed
Hispanic	Failed	Failed	Failed	Failed	Failed	Failed
Native American	Failed	Passed	Failed	Failed	Passed	Passed
Other	Failed	Failed	Passed	Failed	Failed	Failed

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Audit Results: Bias Metrics Values

Unnamed: 0

Attribute Value	Predicted Positive Rate Disparity	Predicted Positive Group Rate Disparity	False Discovery Rate Disparity	False Positive Rate Disparity	False Omission Rate Disparity	False Negative Rate Disparity
0.00-1803.25	1.0	1.0	1.0	1.0	1.0	1.0
1803.25-3606.50	1.1	1.1	0.97	1.12	1.07	0.98
3606.50-5409.75	0.97	0.97	0.83	0.84	1.07	1.01
5409.75-7213.00	0.96	0.96	0.92	0.92	1.08	1.03

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sex

Attribute Value	Predicted Positive Rate Disparity	Predicted Positive Group Rate Disparity	False Discovery Rate Disparity	False Positive Rate Disparity	False Omission Rate Disparity	False Negative Rate Disparity
Female	0.15	0.64	1.4	0.74	0.78	1.14
Male	1.0	1.0	1.0	1.0	1.0	1.0

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age_cat

Attribute Value	Predicted Positive Rate Disparity	Predicted Positive Group Rate Disparity	False Discovery Rate Disparity	False Positive Rate Disparity	False Omission Rate Disparity	False Negative Rate Disparity
25 - 45	1.0	1.0	1.0	1.0	1.0	1.0
Greater than 45	0.16	0.41	1.31	0.42	0.73	1.23
Less than 25	0.55	1.48	0.93	1.71	1.25	0.89

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race

Attribute Value	Predicted Positive Rate Disparity	Predicted Positive Group Rate Disparity	False Discovery Rate Disparity	False Positive Rate Disparity	False Omission Rate Disparity	False Negative Rate Disparity
African-American	1.0	1.0	1.0	1.0	1.0	1.0
Asian	0.0	0.33	1.21	0.27	0.56	1.29
Caucasian	0.28	0.42	1.08	0.36	0.82	1.31
Hispanic	0.07	0.4	1.56	0.48	0.78	1.37
Native American	0.01	1.18	0.61	0.78	0.97	0.83
Other	0.03	0.25	0.81	0.15	0.74	1.4

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Audit Results: Group Metrics Values

Unnamed: 0

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
0.00-1803.25	0.25	0.25	0.2	0.31	0.11	0.37	0.68
1803.25-3606.50	0.25	0.27	0.22	0.3	0.12	0.39	0.67
3606.50-5409.75	0.25	0.24	0.19	0.25	0.09	0.39	0.69

5409.75-7213.00	0.25	0.24	0.19	0.28	0.1	0.39	0.7

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sex

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
Female	0.19	0.13	0.14	0.38	0.08	0.32	0.76
Male	0.81	0.87	0.21	0.27	0.11	0.4	0.67

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age_cat

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
25 - 45	0.57	0.59	0.21	0.28	0.11	0.39	0.68
Greater than 45	0.22	0.09	0.08	0.37	0.05	0.29	0.83
Less than 25	0.21	0.32	0.3	0.27	0.18	0.49	0.61

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race

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
African-American	0.51	0.72	0.28	0.28	0.16	0.43	0.6
Asian	0	0.0	0.09	0.33	0.04	0.24	0.78

Caucasian	0.34	0.2	0.12	0.3	0.06	0.35	0.79
Hispanic	0.09	0.05	0.11	0.43	0.08	0.34	0.82
Native American	0	0.0	0.33	0.17	0.12	0.42	0.5
Other	0.05	0.02	0.07	0.22	0.02	0.32	0.84

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