

The Bias Report

Audit Date:	07 Dec 2022
Data Audited:	1000 rows
Attributes Audited:	Sex, Age, Foreign
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:	Custom group - The reference groups you selected for each attribute will be used to calculate relative disparities in this audit.
Fairness Threshold:	90%. If disparity for a group is within 90% and 111% of the value of the reference group on a group metric (e.g. False Positive Rate), this audit will pass.

Audit Results:

1. Summary
2. Details by Fairness Measures
3. Details by Protected Attributes
4. Bias Metrics Values
5. Base Metrics Calculated for Each Group

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.	Passed	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

Audit Results: Details by Fairness Measures

Equal Parity: **Failed**

What is it?

This criteria considers an attribute to have equal parity if 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 married/widowed**)
female divorced/separated/married with **3.28X** Disparity
male single with **5.82X** Disparity
male divorced/separated with **0.53X** Disparity

For Foreign (with reference group as **no**)
yes with **24.50X** Disparity

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Proportional Parity: **Passed**

What is it?

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.

When does it matter?

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

Which groups failed the audit:

Based on the fairness threshold used, all groups passed the audit for this metric.

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False Positive Rate Parity: **Failed**

What is it?

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.

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 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.

Which groups failed the audit:

For Sex (with reference group as **male married/widowed**)
female divorced/separated/married with **0.84X** Disparity
male divorced/separated with **0.88X** Disparity
male single with **0.71X** Disparity

For Age (with reference group as **Older**)
Middle1 with **1.29X** Disparity
Middle2 with **1.13X** Disparity
Younger with **1.37X** Disparity

For Foreign (with reference group as **no**)
yes with **2.16X** Disparity

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False Discovery Rate Parity: **Failed**

What is it?	When does it matter?	Which groups failed the audit:
<p>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 Discovery Error Rate.</p>	<p>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.</p>	<p>For Sex (with reference group as male married/widowed)</p> <p>female divorced/separated/married with 1.11X Disparity</p> <p>male single with 0.71X Disparity</p> <p>male divorced/separated with 1.34X Disparity</p> <p>For Age (with reference group as Older)</p> <p>Middle1 with 1.48X Disparity</p> <p>Younger with 1.97X Disparity</p> <p>For Foreign (with reference group as no)</p> <p>yes with 6.53X Disparity</p>

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False Negative Rate Parity: **Failed**

What is it?	When does it matter?	Which groups failed the audit:
<p>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.</p>	<p>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.</p>	<p>For Sex (with reference group as male married/widowed)</p> <p>male divorced/separated with 0.74X Disparity</p> <p>female divorced/separated/married with 0.75X Disparity</p> <p>male single with 0.74X Disparity</p> <p>For Age (with reference group as Older)</p> <p>Younger with 0.81X Disparity</p> <p>Middle1 with 1.26X Disparity</p> <p>Middle2 with 1.21X Disparity</p> <p>For Foreign (with reference group as no)</p> <p>yes with 1.14X Disparity</p>

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False Omission Rate Parity: **Failed**

What is it?	When does it matter?	Which groups failed the audit:
<p>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.</p>	<p>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.</p>	<p>For Sex (with reference group as male married/widowed) female divorced/separated/married with 0.61X Disparity male single with 0.68X Disparity male divorced/separated with 0.56X Disparity</p> <p>For Age (with reference group as Older) Middle2 with 1.25X Disparity Middle1 with 1.18X Disparity Younger with 0.75X Disparity</p> <p>For Foreign (with reference group as no) yes with 0.71X Disparity</p>

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Audit Results: Details by Protected Attributes

Sex

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity
female divorced/separated/married	female divorced/separated/married	female divorced/separated/married	female divorced/separated/married	female divorced/separated/married	female divorced/separated/married
male divorced/separated	male divorced/separated	male divorced/separated	male divorced/separated	male divorced/separated	male divorced/separated
male married/widowed	Ref	Ref	Ref	Ref	Ref
male single	male single	male single	male single	male single	male single

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Age

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
Middle1	Middle1	Middle1	Middle1	Middle1	Middle1	Middle1
Middle2	Middle2	Middle2	Middle2	Middle2	Middle2	Middle2
Older	Ref	Ref	Ref	Ref	Ref	Ref
Younger	Younger	Younger	Younger	Younger	Younger	Younger

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Foreign

Attribute Value	Equal Parity	Proportional Parity	False Discovery Rate Parity	False Positive Rate Parity	False Omission Rate Parity	False Negative Rate Parity
no	Ref	Ref	Ref	Ref	Ref	Ref
yes	yes	yes	yes	yes	yes	yes

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Audit Results: Bias Metrics Values

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 divorced/separated/married	3.28	0.97	1.11	0.84	0.61	0.75
male divorced/separated	0.53	0.97	1.34	0.88	0.56	0.74
male married/widowed	1.0	1.0	1.0	1.0	1.0	1.0
male single	5.82	0.98	0.71	0.71	0.68	0.74

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Age

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
Middle1	0.94	1.0	1.48	1.29	1.18	1.26
Middle2	1.02	1.0	1.05	1.13	1.25	1.21
Older	1.0	1.0	1.0	1.0	1.0	1.0
Younger	0.96	1.03	1.97	1.37	0.75	0.81

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Foreign

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
no	1.0	1.0	1.0	1.0	1.0	1.0
yes	24.5	0.94	6.53	2.16	0.71	1.14

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Audit Results: Group Metrics Values

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 divorced/separated/married	0.31	0.31	0.76	0.26	0.57	0.36	0.13
male divorced/separated	0.05	0.05	0.76	0.32	0.6	0.33	0.13

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
male married/widowed	0.09	0.09	0.78	0.24	0.68	0.6	0.18
male single	0.55	0.55	0.76	0.17	0.48	0.41	0.13

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Age

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
Middle1	0.24	0.24	0.76	0.23	0.57	0.46	0.16
Middle2	0.26	0.26	0.76	0.16	0.5	0.48	0.15
Older	0.26	0.25	0.76	0.15	0.44	0.39	0.13
Younger	0.24	0.25	0.78	0.3	0.61	0.29	0.1

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Foreign

Attribute Value	Group Size Ratio	Predicted Positive Rate	Predicted Positive Group Rate	False Discovery Rate	False Positive Rate	False Omission Rate	False Negative Rate
no	0.04	0.04	0.81	0.03	0.25	0.57	0.12
yes	0.96	0.96	0.76	0.22	0.54	0.4	0.14

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