Aequitas (/)
Bias & Fairness Audit

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:

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

Audit Results: Details by Fairness Measures

Equal Parity: **Failed**

What is it?	When does it matter?	Which groups failed the audit:
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.	If your desired outcome is to intervene equally on people from all races, then you care about this criteria.	**For Sex** (with reference group as **male married/widowed**) female divorced/separated/married with **3.47X** Disparity male single with **5.76X** Disparity male divorced/separated with **0.46X** Disparity **For Foreign** (with reference group as **no**) yes with **22.33X** 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 married/widowed**) male divorced/separated with **0.84X** Disparity **For Foreign** (with reference group as **no**) yes with **0.86X** 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 married/widowed**) male divorced/separated with **0.78X** Disparity male single with **0.78X** Disparity **For Age** (with reference group as **Older**) Middle2 with **1.13X** Disparity Younger with **1.45X** Disparity Middle1 with **1.38X** Disparity **For Foreign** (with reference group as **no**) yes with **1.11X** 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 married/widowed**)
male divorced/separated with **1.36X** Disparity
female divorced/separated/married with **1.22X** Disparity
male single with **0.79X** Disparity

For Age (with reference group as **Older**)
Middle1 with **1.53X** Disparity
Younger with **1.99X** Disparity

For Foreign (with reference group as **no**)
yes with **3.69X** Disparity

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False Negative Rate Parity: **Failed**

What is it?

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.

When does it matter?

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.

Which groups failed the audit:

For Sex (with reference group as **male married/widowed**)
male divorced/separated with **1.42X** Disparity
female divorced/separated/married with **0.58X** Disparity

For Age (with reference group as **Older**)
Younger with **0.65X** Disparity

For Foreign (with reference group as **no**)
yes with **2.35X** Disparity

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False Omission Rate Parity: **Failed**

What is it?

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.

When does it matter?

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.

Which groups failed the audit:

For Sex (with reference group as **male married/widowed**)
male divorced/separated with **0.75X** Disparity
male single with **0.82X** Disparity
female divorced/separated/married with **0.58X** Disparity

For Age (with reference group as **Older**)
Younger with **0.69X** Disparity
Middle1 with **1.14X** Disparity

For Foreign (with reference group as **no**)
yes with **0.84X** Disparity

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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/marri
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	3.47	1.03	1.22	0.97	0.58	0.58
male divorced/separated	0.46	0.84	1.36	0.78	0.75	1.42
male married/widowed	1.0	1.0	1.0	1.0	1.0	1.0
male single	5.76	0.97	0.79	0.78	0.82	0.91

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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	0.98	1.04	1.53	1.38	1.14	1.08
Middle2	1.05	1.04	1.02	1.13	1.1	0.96
Older	1.0	1.0	1.0	1.0	1.0	1.0
Younger	1.01	1.08	1.99	1.45	0.69	0.65

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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	22.33	0.86	3.69	1.11	0.84	2.35

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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	0.32	0.81	0.27	0.62	0.32	0.09
male divorced/separated	0.05	0.04	0.66	0.3	0.5	0.41	0.23
male married/widowed	0.09	0.09	0.78	0.22	0.64	0.55	0.16

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 single	0.55	0.54	0.76	0.18	0.5	0.45	0.15

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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	0.77	0.24	0.61	0.48	0.16
Middle2	0.26	0.26	0.77	0.16	0.5	0.47	0.14
Older	0.26	0.25	0.74	0.16	0.44	0.42	0.15
Younger	0.24	0.25	0.8	0.31	0.64	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	0.89	0.06	0.5	0.5	0.06
yes	0.96	0.96	0.77	0.22	0.56	0.42	0.14

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