

The Bias Report

| | |
|---------------------|---|
| Audit Date: | 03 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. | 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?

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 married/widowed**)
female divorced/separated/married with **2.68X** Disparity
male single with **5.58X** Disparity
male divorced/separated with **0.38X** Disparity

For Age (with reference group as **42.00-75.00**)
27.00-33.00 with **0.86X** Disparity

For Foreign (with reference group as **no**)
yes with **21.41X** Disparity

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Proportional Parity: **Failed**

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:

For Sex (with reference group as **male married/widowed**)
male divorced/separated with **0.70X** Disparity
female divorced/separated/married with **0.80X** Disparity

For Age (with reference group as **42.00-75.00**)
19.00-27.00 with **0.86X** Disparity

For Foreign (with reference group as **no**)
yes with **0.82X** Disparity

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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**)
male divorced/separated with **0.56X** Disparity
male single with **0.68X** Disparity
female divorced/separated/married with **0.50X** Disparity

For Age (with reference group as **42.00-75.00**)
33.00-42.00 with **1.12X** 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> <ul style="list-style-type: none">male single with 0.72X Disparityfemale divorced/separated/married with 0.82X Disparitymale divorced/separated with 1.18X Disparity <p>For Age (with reference group as 42.00-75.00)</p> <ul style="list-style-type: none">27.00-33.00 with 1.42X Disparity19.00-27.00 with 1.51X Disparity <p>For Foreign (with reference group as no)</p> <ul style="list-style-type: none">yes with 3.53X Disparity |

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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> <ul style="list-style-type: none">male divorced/separated with 2.51X Disparitymale single with 0.85X Disparityfemale divorced/separated/married with 1.38X Disparity <p>For Age (with reference group as 42.00-75.00)</p> <ul style="list-style-type: none">33.00-42.00 with 0.87X Disparity19.00-27.00 with 1.79X Disparity27.00-33.00 with 1.77X Disparity <p>For Foreign (with reference group as no)</p> <ul style="list-style-type: none">yes with 4.45X 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 **0.73X** Disparity
female divorced/separated/married with **0.55X** Disparity
male single with **0.62X** Disparity

For Age (with reference group as **42.00-75.00**)
27.00-33.00 with **1.13X** Disparity

For Foreign (with reference group as **no**)
yes with **1.15X** 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/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 |
|-----------------|--------------|---------------------|-----------------------------|----------------------------|----------------------------|----------------------------|
| 19.00-27.00 | 19.00-27.00 | 19.00-27.00 | 19.00-27.00 | 19.00-27.00 | 19.00-27.00 | 19.00-27.00 |
| 27.00-33.00 | 27.00-33.00 | 27.00-33.00 | 27.00-33.00 | 27.00-33.00 | 27.00-33.00 | 27.00-33.00 |
| 33.00-42.00 | 33.00-42.00 | 33.00-42.00 | 33.00-42.00 | 33.00-42.00 | 33.00-42.00 | 33.00-42.00 |
| 42.00-75.00 | Ref | Ref | Ref | Ref | Ref | Ref |

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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 | 2.68 | 0.8 | 0.82 | 0.5 | 0.55 | 1.38 |
| male divorced/separated | 0.38 | 0.7 | 1.18 | 0.56 | 0.73 | 2.51 |
| male married/widowed | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| male single | 5.58 | 0.94 | 0.72 | 0.68 | 0.62 | 0.85 |

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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 |
|-----------------|-----------------------------------|---|--------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 19.00-27.00 | 1.07 | 0.86 | 1.51 | 0.9 | 0.97 | 1.79 |
| 27.00-33.00 | 0.86 | 0.9 | 1.42 | 0.99 | 1.13 | 1.77 |
| 33.00-42.00 | 1.1 | 1.04 | 1.0 | 1.12 | 1.06 | 0.87 |
| 42.00-75.00 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

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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 | 21.41 | 0.82 | 3.53 | 1.02 | 1.15 | 4.45 |

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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 | 0.28 | 0.68 | 0.21 | 0.4 | 0.34 | 0.16 |
| male divorced/separated | 0.05 | 0.04 | 0.6 | 0.3 | 0.45 | 0.45 | 0.3 |
| male married/widowed | 0.09 | 0.1 | 0.86 | 0.25 | 0.8 | 0.62 | 0.12 |

| 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 | 0.58 | 0.8 | 0.18 | 0.55 | 0.38 | 0.1 |

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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 |
|-----------------|------------------|-------------------------|-------------------------------|----------------------|---------------------|---------------------|---------------------|
| 19.00-27.00 | 0.29 | 0.27 | 0.69 | 0.25 | 0.47 | 0.36 | 0.17 |
| 27.00-33.00 | 0.22 | 0.21 | 0.72 | 0.23 | 0.51 | 0.42 | 0.17 |
| 33.00-42.00 | 0.25 | 0.27 | 0.84 | 0.16 | 0.58 | 0.39 | 0.08 |
| 42.00-75.00 | 0.24 | 0.25 | 0.8 | 0.16 | 0.52 | 0.37 | 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 | 0.92 | 0.06 | 0.5 | 0.33 | 0.03 |
| yes | 0.96 | 0.96 | 0.76 | 0.21 | 0.51 | 0.38 | 0.13 |

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