

Addressing Genetic Discrimination for Stronger Legal Protections and Enhanced Public Awareness

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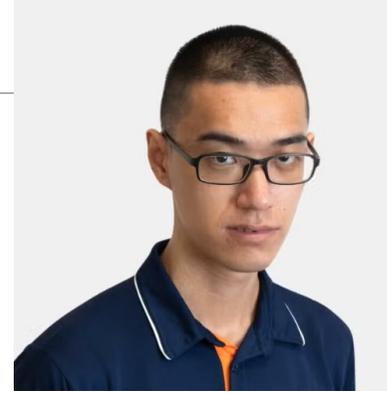
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What is Genetic Discrimination?

Genetic Discrimination:

Unfair treatment, profiling, or harm experienced by individuals or groups due to their actual or presumed genetic characteristics, resulting in disadvantages compared to the rest of the population.

Kaiser, B., Uberoi, D., Raven-Adams, M.C. *et al.* A proposal for an inclusive working definition of genetic discrimination to promote a more coherent debate. *Nat Genet* 56, 1339–1345 (2024).
<https://doi.org/10.1038/s41588-024-01786-8>



International Regulatory Landscape

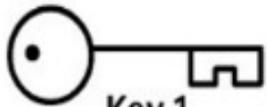
Country	Main Instrument / Approach	Key Features (very short)
United States	GINA (Genetic Information Nondiscrimination Act, 2008)	Bans use of genetic info in employment and health insurance ; life insurance not covered .
Canada	Genetic Non-Discrimination Act (GNDA, 2017)	Largely prohibits requiring or using genetic test results in insurance and services; strong criminal penalties.
United Kingdom	Government-ABI Agreement (Code on Genetic Testing and Insurance)	Industry moratorium ; very limited use of certain predictive tests above high sum-assured thresholds.
Singapore	MOH-LIA Moratorium on Genetics and Insurance	Insurers may use predictive tests only for specified conditions and above set financial limits.
Japan	Genome Medical Care Promotion Act & professional guidelines	Declares prohibition of unjust discrimination based on genetic characteristics; relies heavily on soft law/guidance.
South Korea	Bioethics and Safety Act	Prohibits discrimination based on genetic info; regulates genetic testing and human subjects research.

FINANCIAL THRESHOLD

Life/Total Permanent Disability
SGD 2M (1.46M USD)

Long-Term Care
(Two or More ADLs)
SGD 3K(2.2K USD)/month

Disability Income
SGD10K(7.3K USD)/month



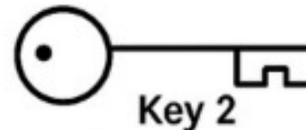
Key 1



Coverage Amount
Exceeds Threshold?

SPECIFIC APPROVED PREDICTIVE GENETIC TESTS

Huntington's Disease (HTT)
Breast Cancer (BRCA1, BRCA2)



Key 2



If either key is not satisfied, genetic test disclosure is not required.



ASKING AND USING
PREDICTIVE TEST
RESULT IS
PERMISSIBLE



Singapore's Moratorium and the "Double-Key" Model in Life Insurance



Why We Conducted This Study

1. To measure awareness and attitudes towards genetic testing among Singapore residents.
2. To document self-reported experiences of genetic discrimination across insurance, employment, and interpersonal domains.
3. To assess public knowledge of existing protections, including the moratorium.
4. To explore what people consider fair or unfair uses of genetic and group-level risk information in insurance and employment decisions.

Methods

Our Centre manages the Health Opinion Panel Singapore (HOPS), which is an online research panel. The demographic breakdown shown below.

We surveyed 1000 participants.

We used Qualtrics.

Compensation \$30 voucher.

Female				Female Total	Age Groups	Male				Male Total	Grand Total
Chinese	Indian	Malay	Others			Chinese	Indian	Malay	Others		
3.1%	0.4%	0.6%	0.0%	4.1%	21 to 29	2.7%	0.2%	0.2%	0.0%	3.1%	7.2%
9.8%	1.7%	0.9%	0.4%	12.8%	30 to 39	7.5%	1.1%	0.6%	0.3%	9.5%	22.3%
9.4%	1.8%	1.0%	0.8%	12.9%	40 to 49	7.9%	1.1%	0.5%	0.6%	10.2%	23.1%
9.5%	1.2%	0.8%	0.3%	11.8%	50 to 59	6.1%	1.1%	0.4%	0.2%	7.9%	19.6%
11.8%	0.6%	0.4%	0.1%	12.9%	60 to 69	5.3%	0.4%	0.3%	0.3%	6.3%	19.2%
4.3%	0.4%	0.0%	0.1%	4.9%	≥ 70	3.2%	0.3%	0.0%	0.2%	3.7%	8.5%
47.8%	6.1%	3.7%	1.7%	59.4%	Grand Total	32.8%	4.3%	2.0%	1.5%	40.6%	100.0%

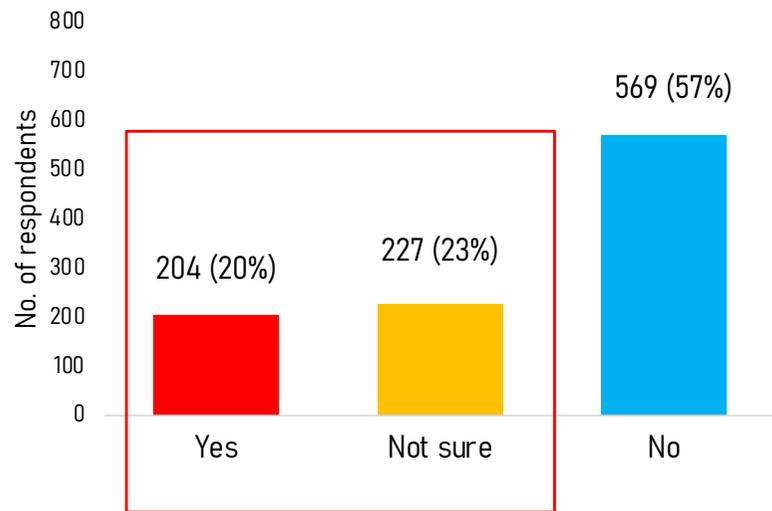
Results



1. Awareness and Attitudes on Genetic Testing

Which of the following apply to you? (select all that apply)

Does the idea of taking a genetic test make you worried?



43% Yes

Statement	No. (%)
Even though I am worried, I still want to take genetic tests if I would benefit from the results	231 (54%)
Even though I am worried, I still want to take genetic tests if my family would benefit from the results	215 (50%)
Regardless of the potential benefits, I do not want to take genetic tests.	107 (25%)
I still want to take genetic tests for other reasons.	66 (15%)
I do not want to take genetic tests because I think they have no benefit for me.	42 (10%)

*Answered by those who chose "Yes" & "Not Sure" in Q6, n=431

Awareness and Attitudes on Genetic Testing

I am worried about taking genetic tests because of the following (Select all that apply).

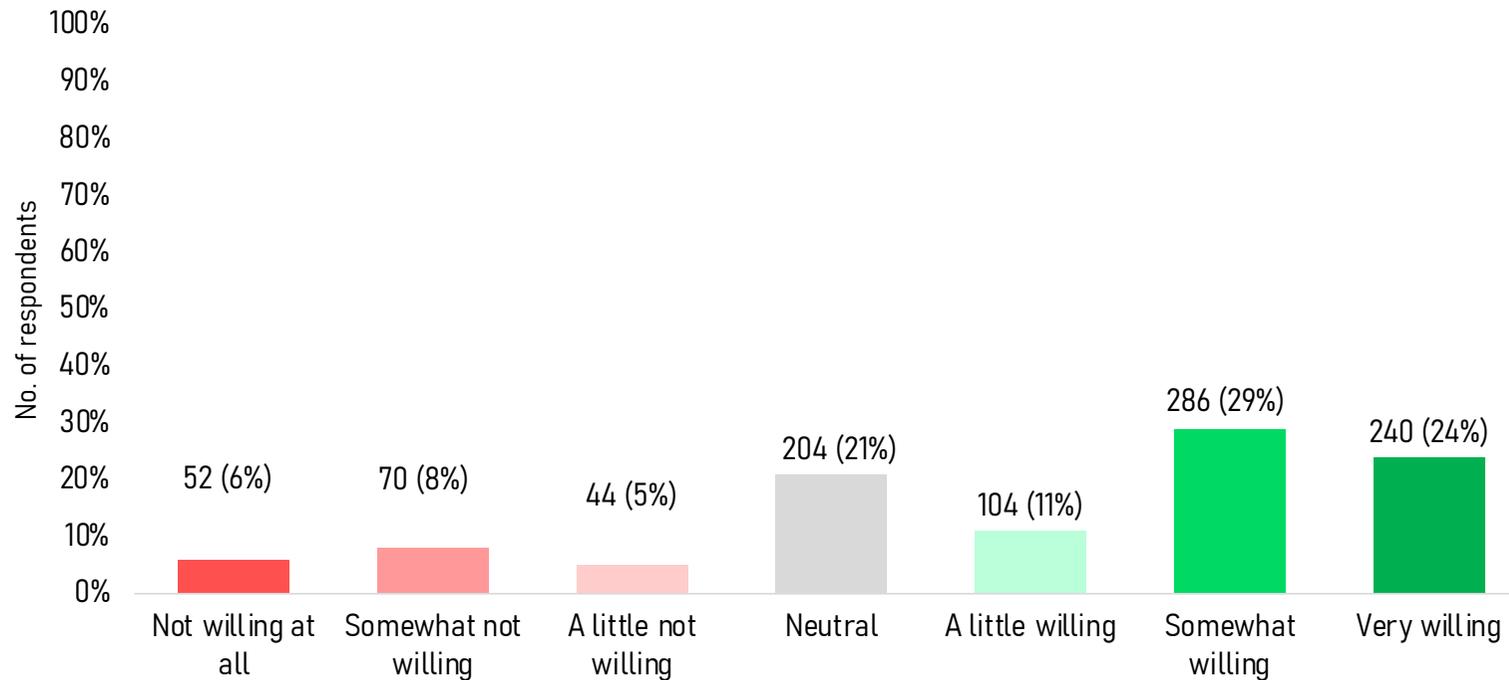
*Answered by those who chose “Yes” and “Not Sure” about being worried, n=431

Concern	No. (%)
The results of the test may suggest that I have a higher risk of certain diseases	263 (62%)
I may be disadvantaged when buying insurance if those companies know the results	260 (61%)
The procedure may be painful	146 (34%)
I may be disadvantaged at work (e.g., fired or denied promotion) if my employer knows the results	130 (31%)
I may no longer qualify for social welfare subsidies if the relevant agencies know the results	96 (23%)
I may be pressured into not having children if my family members know the results	87 (21%)
I may be disadvantaged when applying for loans if banks know the results	84 (20%)
I may not be able to marry if my partner knows the results	79 (19%)



Awareness and Attitudes on Genetic Testing

How willing are you to undergo a clinical genetic test that is offered by your doctor for medical reasons, where the cost is fully covered nationally? **64%** were willing!



2. Lived Experience of Genetic Discrimination (Insurance)

Those who said insurance companies learnt about their genetic information were:

Options	No. of respondents (n=281)
Charged a higher insurance premium	152 (54%)
Denied insurance application	133 (47%)
No change in how I was treated	78 (28%)
Denied insurance claim	74 (26%)

Of the 281 respondents who reported that insurance companies learnt about their genetic information, **72%** experienced discrimination and 28% reported no change.

Lived Experience of Genetic Discrimination (Employment)

The responses of those who said employers learnt about their genetic information are:

Options	No. of respondents (n=164)
No change in how I was treated	125 (76%)
Job application was denied	42 (26%)
Denied promotion/pay raise	31 (19%)
Placed under surveillance at work	33 (20%)
Treated unfairly in other ways by my employer	30 (18%)
Fired from work	14 (9%)

Of the 164 respondents who reported that insurance companies learnt about their genetic information, **24%** experienced discrimination and 76% reported no change.

3. Awareness of Existing Protections & Preference for Regulation

In Singapore, insurance companies are allowed to do the following when you apply for **life** insurance:

Statement	True	False	Unsure
Ask for your genetic information	219 (22%)	367 (37%)	414 (42%)
Ask you to take a genetic test	91 (10%)	481 (49%)	428 (43%)
Ask you for your genetic test results from biomedical research	101 (11%)	457 (46%)	442 (45%)
Ask you to disclose the result of a predictive genetic test	141 (15%)	388 (39%)	471 (48%)
Ask you to disclose the result of a diagnostic genetic test	175 (18%)	363 (37%)	462 (47%)

3. Awareness of Existing Protections & Preference for Regulation

Please state if you think the following statements are true or false.

Statement	True	False	Unsure
In Singapore, it does not violate fair employment practices for employers to treat workers differently due to their genetic information	177 (18%)	480 (48%)	343 (35%)
In Singapore, the upcoming workplace fairness law does not protect workers from being treated differently due to their genetic information	143 (15%)	394 (40%)	463 (47%)

4. Appropriate Use of Genetic Information

Is it wrong for the following parties to treat people differently based on their genetic information only?

Party	Yes, it is wrong	No, it is not wrong	Neither right nor wrong	Not sure
Insurance companies	614 (62%)	74 (8%)	192 (20%)	120 (12%)
Hiring managers of companies	744 (75%)	42 (5%)	111 (12%)	103 (11%)
Banks deciding loan applications	701 (71%)	47 (5%)	131 (14%)	121 (13%)
School admissions officers	798 (80%)	32 (4%)	74 (8%)	96 (10%)
Social welfare agencies	765 (77%)	53 (6%)	97 (10%)	85 (9%)
Army officers managing National Servicemen	536 (54%)	166 (17%)	146 (15%)	152 (16%)

Discussion

- 64% expressed willingness to undergo genetic testing that is medically indicated.
 - 20% (total) of the participants experienced GD in life insurance
 - 9% (total) in employment.
 - Majority identified existing safeguards incorrectly
- 



November 14, 2025, Launch Event

Conclusion:

Singapore has now moved to Phase III of the national precision strategy to understanding and addressing the practical challenges of integrating precision medicine into clinical care.