

Identifying Distinct Antibiotic Behavioural Profiles in Singapore's General Population: A Latent Class Analysis

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BACKGROUND

Inappropriate antibiotic use for upper respiratory tract infections (URTIs) is common. Existing research typically examines misuse practices, like sharing or not finishing antibiotics, without considering upstream decision-making processes determining behavioural patterns. This study aims to identify and characterise distinct antibiotic behavioural profiles within a general population to inform personalised interventions.

METHODS

Nationally representative population-based study
N=2004 Singapore residents (i.e. citizens or permanent residents) aged 21 years and above
Self-administered survey disseminated using drop-off/pick-up method

Conducted **between November 2020 and January 2021**

Latent class analysis to classify respondents into distinct antibiotic behavioural profiles, using 17 survey items mapped against 6 antibiotic decision-making stages defined by Duan et al 2022:
(a) need recognition, (b) information seeking, (c) alternative evaluation, (d) antibiotic obtaining, (e) antibiotic consumption and (f) post-consumption evaluation

Multinomial logistic regression to characterise each profile using: (i) knowledge of antibiotic use, (ii) knowledge of antimicrobial resistance (AMR), (iii) eHealth literacy, (iv) overall trust in doctors, (v) previous use of antibiotics and (vi) basic demographic data

RESULTS

Table 2: Items mapped against 6 antibiotic decision-making stages

Need recognition
Need1: Expect antibiotics to be prescribed by doctor if suffering from common cold/flu symptoms
Need2: Will take antibiotics to prevent cold/flu from getting worse
Information seeking
Info1: Know where to look for information on health when need advice or assistance for health-related matters like medication, diseases, health and general well-being
Info2: Able to seek advice from a doctor, when need advice or assistance for health-related matters like medication, diseases, health and general well-being
Info3: Have family members with whom feel comfortable to discuss health issues with
Info4: Have friends with whom feel comfortable to discuss health issues with
Alternative evaluation
Alt1: When unwell, see a doctor to manage symptoms
Alt2: When unwell, use western medicine (Panadol, Decolgen, Woods Cough Syrup etc.) to manage symptoms
Alt3: When unwell, use complementary and alternative medicine (Traditional Chinese Medicine, Jamu, Ayurvedic Medicine, herbal tea, vitamin etc.) to manage symptoms
Alt4: When unwell, rest and let body recover on its own
Antibiotic obtaining
Obt1: See another doctor if doctor does not give antibiotics
Obt2: Take leftover antibiotics based on personal judgment
Antibiotic consumption
Cons1: Stop taking antibiotics upon starting to feel better
Cons2: Stop taking the antibiotic upon experiencing side effects
Post-consumption evaluation
Eval1: Perceived absence of harm from taking antibiotics
Eval2: Worry about the side effects of antibiotics
Eval3: Perceived usefulness of antibiotics in treating common cold and flu

Antibiotic avoiders showed universal use of over-the-counter medicine and rest to manage unwell symptoms. **Antibiotic appropriates** were least likely to stop antibiotic courses prematurely and to perceive usefulness of antibiotics for cold/flu. **Antibiotic seekers** displayed high perceived need for antibiotics for cold/flu and to prevent it from worsening, and more likely to doctor hop to obtain antibiotics and use leftover antibiotics.

Table 3: Characteristics associated with antibiotic behavioural profiles (N=2004)

(Reference: Antibiotic appropriate)

Characteristics	 Antibiotic avoider		 Antibiotic seeker	
	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Aged 21-34 years (ref: ≥50 years)	1.34 (0.92-1.97)	0.128	3.23 (1.92-5.43)	<0.001
Aged 35-49 years (ref: ≥50 years)	1.17 (0.81-1.68)	0.411	1.50 (0.87-2.58)	0.143
Male	0.95 (0.76-1.18)	0.628	1.49 (1.17-1.90)	0.001
Non-Chinese	0.71 (0.51-0.98)	0.039	2.12 (1.51-2.99)	<0.001
Lower educated	0.60 (0.40-0.90)	0.014	3.04 (1.89-4.91)	<0.001
Never used antibiotics before	0.51 (0.21-1.24)	0.137	1.42 (0.75-2.69)	0.281
Poor knowledge of antibiotic use	1.10 (0.87-1.39)	0.424	3.71 (2.89-4.76)	<0.001
Poor knowledge of AMR	1.10 (0.62-1.94)	0.754	3.51 (1.05-11.76)	0.042
Low eHealth literacy	0.81 (0.64-1.02)	0.068	1.34 (1.02-1.77)	0.038
High overall trust in doctors	0.73 (0.47-1.12)	0.149	2.14 (1.44-3.17)	<0.001

Also adjusted for interaction terms between (a) age and education level, (b) ethnicity and education level, and (c) age and overall trust in doctors (not shown in this table)

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Table 1: Basic characteristics of respondents (N=2004)

Characteristics	N (%)
Age group	
21-34 years old	615 (30.7)
35-49 years old	658 (32.8)
≥50 years old	731 (36.5)
Gender	
Male	954 (47.6)
Ethnicity	
Non-Chinese (i.e. Malay, Indian, Others)	566 (28.2)
Education level	
Lower educated (i.e. Post-Secondary and below)	696 (34.7)
Ever used antibiotics before	
No	56 (2.8)
Knowledge of antibiotic use	
Poor	816 (40.7)
Knowledge of AMR	
Poor	1944 (97.0)
eHealth literacy	
Low	1352 (67.5)
Overall trust in doctors	
High	684 (34.1)

The respondents were classified into three main profiles: **Antibiotic appropriates (53.0%)**, **Antibiotic avoiders (24.9%)** and **Antibiotic seekers (22.2%)**.

- All three profiles did not differ in their ability to seek doctor's advice or assistance for health-related matters.

Figure 1: Frequency of Table 2 items (%) represented across antibiotic behavioural profiles

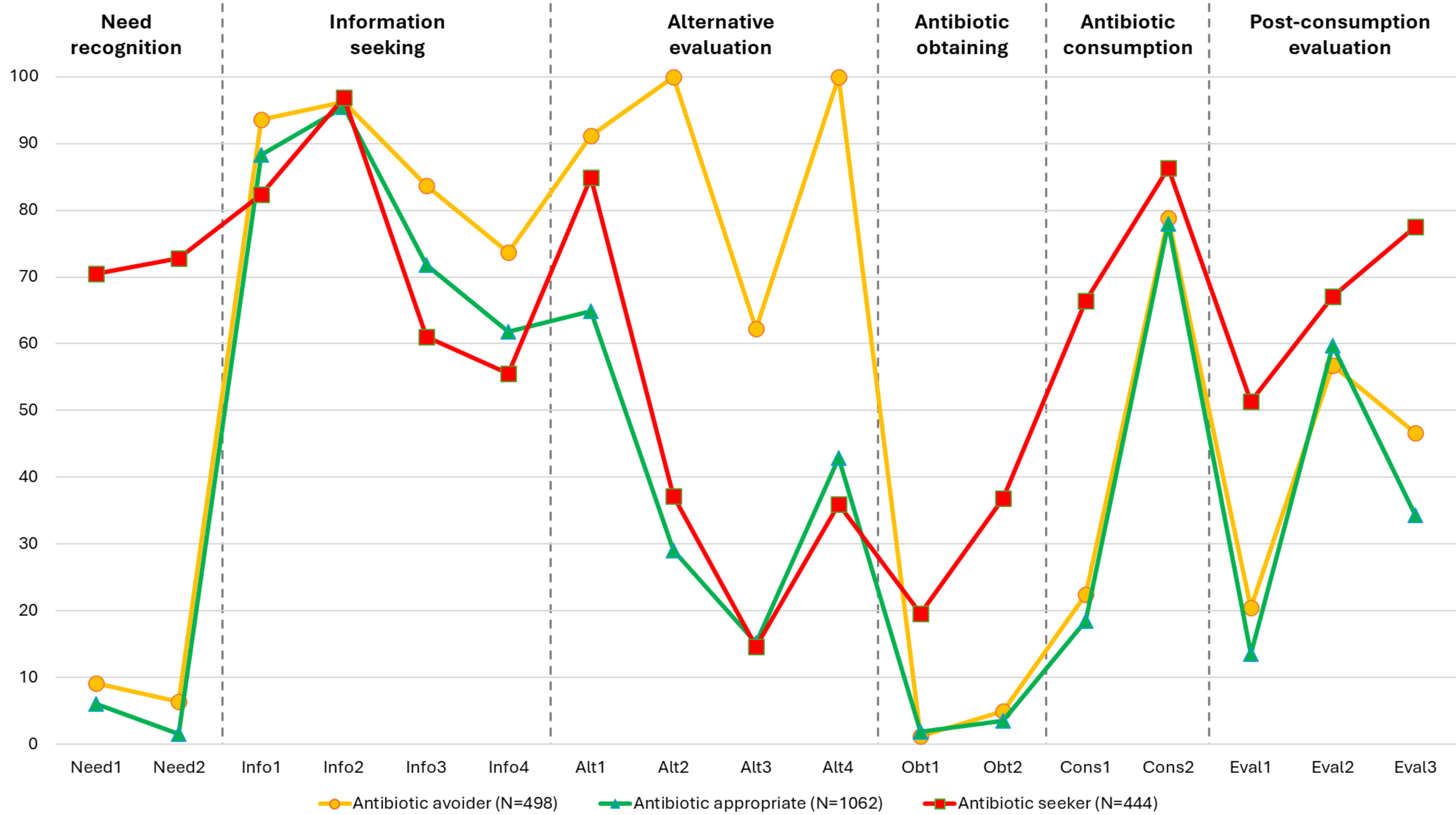


Table 4: Association between education levels and "antibiotic seeker" profile, stratified by age group (Reference: Antibiotic appropriate)

	Aged 21-34 years		Aged 35-49 years		Aged ≥50 years	
	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Higher educated	Ref	-	Ref	-	Ref	-
Lower educated	1.44 (0.83-2.49)	0.198	2.77 (1.61-4.78)	<0.001	4.09 (2.39-7.00)	<0.001

Adjusted for age, gender, ethnicity, educational level, ever used antibiotics, knowledge of antibiotic use, knowledge of AMR, eHealth literacy and overall trust in doctors

Young adults, males, non-Chinese, lower educated, those with poor knowledge of antibiotic use and AMR, and those with low eHealth literacy and high overall trust in doctors were more likely to be **antibiotic seekers**. In particular, amongst lower educated individuals, the likelihood of being an "antibiotic seeker" increased with age.

CONCLUSION

Approximately one-in-five Singapore residents are antibiotic seekers. Targeted education during multiple clinic visits, leveraging high trust in doctors, can address antibiotic knowledge gaps and misperceptions, reducing antibiotic misuse.

References:

- Kasse GE et al. Antimicrobial prescription pattern and appropriateness for respiratory tract infection in outpatients: a systematic review and meta-analysis. Syst Rev 2024;13(1):229.
- Duan L et al. The vicious cycle of the public's irrational use of antibiotics for upper respiratory tract infections: A mixed methods systematic review. Front Public Health 2022;10:985188.
- Mulchandani R et al. Global trends in inappropriate use of antibiotics, 2000-2021: scoping review and prevalence estimates. BMJ Public Health 2025;3(1):e002411.
- Zanichelli V et al. Patient-related determinants of antibiotic use: a systematic review. Clin Microbiol Infect 2019;25(1):48-53.
- Guo H et al. The Associations between Poor Antibiotic and Antimicrobial Resistance Knowledge and Inappropriate Antibiotic Use in the General Population Are Modified by Age. Antibiotics (Basel) 2023;12(1):47.
- Norman CD, Skinner HA. eHEALS: The eHealth Literacy Scale. J Med Internet Res 2006;8(4):e27.
- Hall MA et al. Trust in the medical profession: conceptual and measurement issues. Health Serv Res 2002;37(5):1419-39.