

Supplementary file captions

Material S1. Chinese college students health survey questionnaire (Translation version in English)

Table S1. The prevalence of atopic and allergic diseases in college students.

Table S2. Association of antibiotic and URTI exposure with atopic and allergic diseases in college students.

Material S1. Chinese college students health survey questionnaire (English version)

Chinese college students health survey questionnaire

Informed consent

Welcome to participate in the Chinese University Student Health Survey. To promote better health management for Chinese college freshmen, you are invited to fill out a questionnaire including several parts: (A) General information; (B) Medical history, (C) Lifestyle habits, (D) Skin health, which take about 15 minutes to answer. We will provide you with reasonable health education and health management based on this information, combined with the results of the health checkup. All the information you fill in will be kept strictly confidential. Continue to fill in the following content, indicating that you and your guardian have understood and are willing to continue to cooperate with our work. Thank you!

A. General information

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| A01. Before you went to university, please provide your address. _____ (Specific to districts and counties) |
| A02. Have you moved to other places (cross-city) in the past 10 years (Single selection, if "No" jump to A04) |
| <input type="radio"/> Never <input type="radio"/> Ever |
| A03. If so, the previous address is? _____ (Specific to districts and counties) |
| A04. Sex (Single selection) |
| <input type="radio"/> Male <input type="radio"/> Female |
| A05. Your Ethnicity: _____ |
| A06. Annual household income. (Single selection) |
| <input type="radio"/> <10,000 <input type="radio"/> 10,000 – 29,999 <input type="radio"/> 30,000 – 49,999 |
| <input type="radio"/> 50,000 – 99,999 <input type="radio"/> 100,000 – 199,999 <input type="radio"/> ≥200,000 |
| A07. Your father's highest education (Single selection) |
| <input type="radio"/> Primary school or <input type="radio"/> Middle school <input type="radio"/> High school |

| |
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| <p>blow</p> <p><input type="radio"/> College <input type="radio"/> Postgraduate or <input type="radio"/> Unclear</p> <p>above</p> |
| <p>A08. Your mother's highest education (<i>Single selection</i>)</p> <p><input type="radio"/> Primary school or <input type="radio"/> Middle school <input type="radio"/> High school</p> <p>blow</p> <p><input type="radio"/> College <input type="radio"/> Postgraduate or <input type="radio"/> Unclear</p> <p>above</p> |

B. Medical History

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| <p>B01. Have you ever been specifically diagnosed with any of the following cardiovascular or metabolic diseases? (<i>Multiple selections are allowed</i>)</p> <p><input type="checkbox"/> Hypertension <input type="checkbox"/> Coronary heart <input type="checkbox"/> Hyperlipidemia</p> <p>disease</p> <p><input type="checkbox"/> Obesity <input type="checkbox"/> Fatty liver <input type="checkbox"/> Gout</p> <p><input type="checkbox"/> Psoriasis <input type="checkbox"/> None of above</p> |
| <p>B02. Have you ever been diagnosed with any of the following allergic diseases? (<i>Multiple selections are allowed</i>)</p> <p><input type="checkbox"/> Asthma <input type="checkbox"/> Allergic Rhinitis <input type="checkbox"/> Allergic</p> <p>conjunctivitis</p> <p><input type="checkbox"/> Eczema <input type="checkbox"/> Urticaria <input type="checkbox"/> None of above</p> |
| <p>B03. Have you ever been diagnosed with any of the following infectious diseases? (<i>Multiple selections are allowed</i>)</p> <p><input type="checkbox"/> Tuberculosis or other <input type="checkbox"/> Hepatitis B <input type="checkbox"/> Hepatitis C</p> <p>forms of tuberculosis</p> <p><input type="checkbox"/> Helicobacter pylori <input type="checkbox"/> HIV infection <input type="checkbox"/> None of above</p> <p>infection</p> |
| <p>B04. Have you ever been diagnosed with any of the following endocrine diseases? (<i>Multiple selections are allowed</i>)</p> |

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|---|---|--|
| <input type="checkbox"/> Type 1 diabetes <input type="checkbox"/> Hypertrichosis <input type="checkbox"/> Graves disease | <input type="checkbox"/> Type 2 diabetes <input type="checkbox"/> Hypothyroidism <input type="checkbox"/> Hashimoto thyroiditis | <input type="checkbox"/> Polycystic ovarian syndrome <input type="checkbox"/> Hyperthyroidism <input type="checkbox"/> None of above |
| B05. Have you ever been diagnosed with any of the following immune diseases? <i>(Multiple selections are allowed)</i> <input type="checkbox"/> SLE <input type="checkbox"/> Uveitis <input type="checkbox"/> None of above | | |
| B06. Have you ever been diagnosed with any of the following hematologic diseases? <i>(Multiple selections are allowed)</i> <input type="checkbox"/> Iron-deficiency anemia <input type="checkbox"/> Anemia <input type="checkbox"/> Lymphadenoma | | |
| <input type="checkbox"/> Megaloblastic anemia <input type="checkbox"/> Hemophilia <input type="checkbox"/> None of above | | |
| <input type="checkbox"/> Thalassemia <input type="checkbox"/> leucocythemia | | |
| B07. Have you ever been diagnosed with any of the following mental or neurological disorders? <i>(Multiple selections are allowed)</i> <input type="checkbox"/> ADHD and attention deficit disorder <input type="checkbox"/> Schizophrenia | | |
| <input type="checkbox"/> Depressive disorder <input type="checkbox"/> None of above | | |
| B08. Have you ever had any of the following food allergies? <i>(Multiple selections are allowed)</i> <input type="checkbox"/> None <input type="checkbox"/> Wheat <input type="checkbox"/> Nuts <input type="checkbox"/> Others | | |
| <input type="checkbox"/> Milk <input type="checkbox"/> Soybean <input type="checkbox"/> Fruit <input type="checkbox"/> Unclear | | |
| <input type="checkbox"/> Egg <input type="checkbox"/> Fish <input type="checkbox"/> Crustaceans (e.g., shrimp, crab, etc.) | | |
| B09. Have you ever been allergic to any of the following medications? <i>(Multiple selections are allowed)</i> | | |

| | | |
|---|---|--|
| <i>selections are allowed)</i> | | |
| <input type="checkbox"/> None | <input type="checkbox"/> Antibiotics | <input type="checkbox"/> Non-steroidal |
| <input type="checkbox"/> Contrast medium | <input type="checkbox"/> Anesthetic | anti-inflammatory drugs |
| | | analgesics (e.g., aspirin) |
| <input type="checkbox"/> Anticonvulsant | <input type="checkbox"/> Chemotherapy | <input type="checkbox"/> Others |
| | drugs | |
| <input type="checkbox"/> Unclear | | |
| B10. Have you ever been allergic to any of the following environmental substances? <i>(Multiple selections are allowed)</i> | | |
| <input type="checkbox"/> None | <input type="checkbox"/> Dust mite | <input type="checkbox"/> Mycete |
| <input type="checkbox"/> Animal skins | <input type="checkbox"/> Pollen | <input type="checkbox"/> House dust |
| <input type="checkbox"/> Cockroach | <input type="checkbox"/> Others | <input type="checkbox"/> Unclear |
| B11. Do you have an excessive bug bite response? <i>(Single selection)</i> | | |
| <input checked="" type="radio"/> No | <input checked="" type="radio"/> Yes | |
| B12. In the past year, have you had a dog, cat, or other small stuffed animal such as rabbit, guinea pig, hamster, etc.? <i>(Multiple selections are allowed)</i> | | |
| <input type="checkbox"/> No | <input type="checkbox"/> Dog | <input type="checkbox"/> Cat |
| <input type="checkbox"/> Other stuffed | <input type="checkbox"/> Unclear | |
| animals | | |
| B13. Do you have a long history of close exposure to chemicals? <i>(Multiple selections are allowed)</i> | | |
| <input type="checkbox"/> None | <input type="checkbox"/> Formaldehyde | <input type="checkbox"/> Gasoline |
| <input type="checkbox"/> Oil varnish | <input type="checkbox"/> Others | <input type="checkbox"/> Unclear |
| B14. Have you used or taken any medication almost every day for the last 2 weeks? <i>(Multiple selections are allowed)</i> | | |
| <input type="checkbox"/> None | <input type="checkbox"/> Antibiotics | <input type="checkbox"/> Nonsteroidal |
| <input type="checkbox"/> Hormone | <input type="checkbox"/> Antituberculosis | anti-inflammatory |
| | drugs | drugs and analgesics |
| <input type="checkbox"/> Others | <input type="checkbox"/> Clear | (NSAIDS) |

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| B15. Whether breastfed after birth or not. (<i>Single selection</i>) | | |
| <input type="radio"/> No | <input type="radio"/> Yes | <input type="radio"/> Unclear |
| B16. How often do you have "colds and fevers" in your early school years (before age of 7 years old)? (<i>Single selection</i>) | | |
| <input type="radio"/> Rare (≤ 1 time/year) | <input type="radio"/> Occasional (2-3 times/year) | <input type="radio"/> Often (4 or more times/year) |
| B17. Which way did you (or your parents) usually deal with your "cold or fever" in the early school age years? (<i>Multiple selections are allowed</i>) | | |
| <input type="checkbox"/> Ignore them | <input type="checkbox"/> Drink more water or have a rest | <input type="checkbox"/> Receive antibiotics orally |
| <input type="checkbox"/> Oral Chinese Traditional medicine | <input type="checkbox"/> Receive antibiotics intravenously | <input type="checkbox"/> Others |
| B18. Which of the following frequency of antibiotic use can improve or cure your "Cold or fever" in the early school age years? (<i>Single selection</i>) | | |
| <input type="radio"/> Rarely, it usually cured without antibiotic treatment | | |
| <input type="radio"/> Often by antibiotics orally | <input type="radio"/> Occasional | |
| <input type="radio"/> Often by antibiotics intravenously | | |

C. Lifestyle Habits

| | | | |
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| C01. Do you smoke (refers to smoking at least one cigarette a day for more than six months) (<i>Single selection, jump to C3 if you choose "hardly"</i>) | | | |
| <input type="radio"/> Hardly | <input type="radio"/> < 1 packet /day (about 20 cigarettes in a packet) | <input type="radio"/> 1-2 packets /day | <input type="radio"/> > 2 packs/day |
| C02. If you smoke, how many years have you smoked in total so far? (<i>Single selection</i>) | | | |

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| <input type="radio"/> < 1 year <input type="radio"/> 1-3 years <input type="radio"/> > 3 years |
| C03. In the last month, your frequency of passive smoking is (the involuntary inhalation of smoke caused by other people's smoking in your living or working environment) (<i>Single selection, jump to C5 if you choose "hardly"</i>) |
| <input type="radio"/> Hardly <input type="radio"/> < 1 day/week <input type="radio"/> 1-2 days/week |
| <input type="radio"/> 3-5 days/week <input type="radio"/> 6-7 days/week |
| C04. How many years have you been second-hand smoking? (<i>Single selection</i>) |
| <input type="radio"/> < 2 years <input type="radio"/> 2-3 years <input type="radio"/> 4-6 years <input type="radio"/> > 6 years |
| C05. How often do you drink alcohol? (referring to once a week for at least six months) (<i>Single selection, jump to C9 if you choose "hardly"</i>) |
| <input type="radio"/> Hardly <input type="radio"/> Once a week <input type="radio"/> 2-4 times/week |
| <input type="radio"/> 5-7 times/week <input type="radio"/> 8-10 times/week <input type="radio"/> > 10 times/week |
| C06. How many years have you been drinking? (<i>Single selection</i>) |
| <input type="radio"/> < 1year <input type="radio"/> 1-3years <input type="radio"/> 4-5years <input type="radio"/> > 5 years |
| C07. What's your main drink? (<i>Single selection</i>) |
| <input type="radio"/> Beer <input type="radio"/> Liqueur <input type="radio"/> Red wine <input type="radio"/> Sweet wine <input type="radio"/> Chinese rice wine |
| C08. How much do you drink on average each time? (<i>Single selection</i>) |
| <input type="radio"/> Less (1 bottle of beer, or 50-100g other types of alcohol) |
| <input type="radio"/> Medium (2 bottles of beer, or 100g other types of alcohol) |
| <input type="radio"/> Much (three bottles of beer, or 150g other types of alcohol) |
| <input type="radio"/> A lot (more than 3 bottles of beer, or more than 150g of other types of alcohol) |

D. Skin Health

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| D01. How many showers do you take per week in the spring and fall? (<i>Single selection</i>) |
| <input type="radio"/> ≤1 time per week <input type="radio"/> 2~4 times per week <input type="radio"/> 5~7 times per week |

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| <input type="radio"/> 8~10 times per week <input type="radio"/> >10 times per week |
| D02. How long do you take a shower in spring and fall? (<i>Single selection</i>) <input type="radio"/> < 5 minutes <input type="radio"/> 5-10 minutes <input type="radio"/> 11-20 minutes <input type="radio"/> 21-30 minutes <input type="radio"/> > 30 minutes |
| D03. What kind of toiletries do you use most? (<i>Single selection</i>) <input type="radio"/> None <input type="radio"/> Soap <input type="radio"/> Shower gel <input type="radio"/> Others |
| D04. In spring and fall, the temperature of your bath is (<i>Single selection</i>) <input type="radio"/> Low temperature(<35 centigrade) <input type="radio"/> Close to the body temperature(35-40 centigrade) <input type="radio"/> High temperature(>40 centigrade) |
| D05. Do you use moisturizer all over your body almost daily in fall and winter? (<i>Single selection</i>) <input type="radio"/> No <input type="radio"/> Yes |
| D06. How often do you use facial cleansing products (e.g. cleanser, soap)? (<i>Single selection</i>) <input type="radio"/> Hardly <input type="radio"/> Usually <input type="radio"/> Once per day <input type="radio"/> ≥twice per day |
| D07. How often have you washed your hair in the past two years? (<i>Single selection</i>) <input type="radio"/> ≥ Twice per day <input type="radio"/> Once per day <input type="radio"/> Once on alternate days <input type="radio"/> Once every 2-6 days <input type="radio"/> Once a week or more |
| D08. In the past two years, what kind of toiletries you use is? (<i>Single selection</i>) <input type="radio"/> None <input type="radio"/> Shampoo <input type="radio"/> Shampoo + conditioner <input type="radio"/> Others |
| D09. Have you used hair care/hair products in the past two years? (<i>multiple selections</i>) <input type="checkbox"/> None <input type="checkbox"/> Essential oil, elastin and other hair |



| | |
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| care products | |
| <input type="checkbox"/> Hair gel | <input type="checkbox"/> Others |
| D10. In the last two years, how often have you dyed your hair? (<i>Single selection</i>) | |
| <input type="radio"/> Never | <input type="radio"/> Less than once a year |
| | <input type="radio"/> Once every 2 to 6 months |
| <input type="radio"/> Once every 7 to 11 months | <input type="radio"/> More than once a month |
| D11. In the past two years, your perm frequency is (<i>Single selection</i>) | |
| <input type="radio"/> Never | <input type="radio"/> Less than once a year |
| | <input type="radio"/> Once every 2 to 6 months |
| <input type="radio"/> Once every 7 to 11 months | <input type="radio"/> More than once a month |
| D12. Do you have frequent itchy skin, and to what extent (0 is not itchy at all and 10 is extremely itchy)? | |
| <div style="text-align: center;"> 0 – 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10  </div> | |
| D13. Do you have regular skin pain, and to what extent (0 is no pain at all and 10 is extreme pain)? | |
| <div style="text-align: center;"> 0 – 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10  </div> | |

Table S1. The prevalence of atopic and allergic diseases in college students

| Disease | N, Prevalence (%) ^a | URTI, n (%) | | | Antibiotics, n (%) | | |
|---------------------------------------|--------------------------------|-------------|-------------|------------|--------------------|--------------|----------------------|
| | | Rare | Occasional | Frequent | Rare / occasional | Often,orally | Often, intravenously |
| Skin | | | | | | | |
| Atopic dermatitis | 776 (3.86) | 174 (2.99) | 459(3.99) | 143(5.1) | 349(3.39) | 263(4.11) | 164(4.79) |
| Hand eczema | 675(3.35) | 145 (2.49) | 407(3.54) | 123(4.38) | 310(3.01) | 243(3.79) | 122(3.57) |
| Allergic reactions to food/drug/light | 456(2.27) | 121(2.08) | 255(2.22) | 80(2.85) | 212(2.06) | 152(2.37) | 92(2.69) |
| Chronic urticaria | 381(1.89) | 96(1.65) | 207(1.8) | 78(2.78) | 170(1.65) | 133(2.08) | 78(2.28) |
| Allergic skin disease ^b | 833(4.14) | 217(3.73) | 460(4) | 156(5.56) | 381(3.7) | 285(4.45) | 167(4.88) |
| Beyond skin | | | | | | | |
| Atopic march ^c | 3139(15.6) | 687(11.79) | 1825(15.88) | 627(22.34) | 1372(13.33) | 1101(17.19) | 666(19.47) |
| Allergic conjunctivitis | 153(0.76) | 32(0.55) | 84(0.73) | 37(1.32) | 63(0.61) | 54(0.84) | 36(1.05) |
| Allergic rhinitis | 2273(15.6) | 486(8.34) | 1327(11.55) | 460(16.39) | 984(9.56) | 809(12.63) | 480(14.03) |
| Asthma | 303(1.51) | 46(0.79) | 171(1.49) | 86(3.06) | 111(1.08) | 117(1.83) | 75(2.19) |

^a The total prevalence of atopic and allergic diseases in our study population.

^b Allergic skin disease includes allergic reactions to food/drug/light, contact dermatitis, and urticaria.

^c Atopic march refers to atopic dermatitis, allergic asthma, allergic rhinitis, and allergic conjunctivitis.

Table S2. Association of antibiotic and URTI exposure with atopic and allergic diseases in college students

| Disease | URTI, aRR (95%CI) ^a | | | Antibiotics, aRR (95%CI) ^a | | |
|---------------------------------------|--------------------------------|-------------------|-------------------|---------------------------------------|-------------------|----------------------|
| | Rare | Occasional | Frequent | Rare / occasional | Often, orally | Often, intravenously |
| Skin | | | | | | |
| Atopic dermatitis | Reference | 1.32 (1.09, 1.54) | 1.59 (1.27, 1.98) | Reference | 1.18 (1.01, 1.39) | 1.36 (1.14, 1.62) |
| Hand eczema | Reference | 1.32 (1.08, 1.56) | 1.60 (1.26, 2.02) | Reference | 1.27 (1.08, 1.49) | 1.17 (0.95, 1.44) |
| Allergic reactions to food/drug/light | Reference | 1.10 (0.92, 1.28) | 1.30 (1.04, 1.63) | Reference | 1.15 (0.97, 1.37) | 1.36 (1.12, 1.65) |
| Chronic urticaria | Reference | 0.97 (0.76, 1.17) | 1.58 (1.21, 2.05) | Reference | 1.13 (0.90, 1.40) | 1.39 (1.09, 1.78) |
| Allergic skin disease ^b | Reference | 1.04 (0.89, 1.20) | 1.46 (1.22, 1.76) | Reference | 1.16 (1.01, 1.34) | 1.33 (1.13, 1.57) |
| Beyond skin | | | | | | |
| Atopic march ^c | Reference | 1.39 (1.26, 1.52) | 2.08 (1.85, 2.34) | Reference | 1.35 (1.24, 1.48) | 1.55 (1.40, 1.71) |
| Allergic conjunctivitis | Reference | 1.89 (1.13, 2.66) | 3.49 (2.05, 5.96) | Reference | 1.58 (1.08, 2.32) | 2.72 (1.75, 4.23) |
| Allergic rhinitis | Reference | 1.43 (1.27, 1.59) | 2.13 (1.86, 2.43) | Reference | 1.39 (1.26, 1.53) | 1.56 (1.39, 1.74) |
| Asthma | Reference | 2.56 (1.69, 3.43) | 4.89 (3.20, 7.47) | Reference | 1.92 (1.52, 2.43) | 2.10 (1.64, 2.70) |

^a Adjusted for the fixed effects of gender, income, education, passive smoking, and ethnicity and the random effect of university.

^b Allergic skin disease includes allergic reactions to food/drug/light, contact dermatitis, and urticaria.

^c Atopic march refers to atopic dermatitis, allergic asthma, allergic rhinitis, and allergic conjunctivitis.