The model for predicting sex using multinomial logistic regression analysis.

1. The model for predicting sex with known AL1-5.

(1) For stage C3:

$$\ln\frac{\pi}{1-\pi} = -0.057822 + 0.51948x_1 - 0.23443x_2 + 4.7999x_3 + 9.4801x_4 - 2.486x_5 - 3.1163x_6 +$$
$$0.70036x_7 - 3.4467x_8 + 1.131x_9 + 4.8864x_{10} + 1.6945x_{11} - 1.4806x_{12} - 0.51381x_{13} +$$
$$1.0368x_{14} - 7.4095x_{15} + 3.8496x_{16} - 0.2244x_{17} + 2.2175x_{18} - 0.50561x_{19} + 2.7024x_{20} +$$
$$1.0447x_{21} - 2.7693x_{22} - 1.3066x_{23} + 0.16009x_{24} - 1.993x_{25} - 6.8904x_{26} - 2.4608x_{27} +$$
$$2.2059x_{28} + 1.0773x_{29}$$

(2) For stage C4:

$$\ln\frac{\pi}{1-\pi} = -0.24719 + 0.45061x_1 - 0.21827x_2 + 2.2831x_3 + 3.2095x_4 + 3.1136x_5 -$$
$$0.85365x_6 + 0.21368x_7 - 5.9786x_8 + 0.83134x_9 + 3.0968x_{10} + 2.604x_{11} - 2.2376x_{12} +$$
$$1.1105x_{13} - 6.2953x_{14} + 1.4874x_{15} + 2.6747x_{16} - 2.5846x_{17} + 3.4373x_{18} + 4.1812x_{19} -$$
$$0.60585x_{20} - 2.2008x_{21} + 1.5059x_{22} - 1.2901x_{23} + 0.8649x_{24} - 0.8769x_{25} - 4.1883x_{26} -$$
$$3.4571x_{27} + 4.0091x_{28} - 1.2754x_{29}$$

(3) For stage C5:

$$\ln\frac{\pi}{1-\pi} = 0.040689 - 0.22585x_1 + 0.22306x_2 - 0.0093714x_3 - 4.0257x_4 + 2.0131x_5 +$$
$$2.4307x_6 + 0.19485x_7 - 2.2064x_8 - 1.0757x_9 - 1.0002x_{10} + 0.38008x_{11} + 1.5548x_{12} -$$
$$1.4343x_{13} - 0.26868x_{14} + 0.11759x_{15} - 0.5134x_{16} - 1.1888x_{17} + 1.8117x_{18} - 1.5527x_{19} +$$
$$1.0722x_{20} + 0.88582x_{21} + 1.5034x_{22} + 0.83391x_{23} - 1.1488x_{24} + 2.0991x_{25} + 1.92476x_{26} +$$
$$0.10094x_{27} - 2.5271x_{28} + 1.3855x_{29}$$

Table S1. Variable and corresponding element used with known AL1-5.

Variable	Element	Variable	Element	Variable	Element
x_1	FCW	x_{11}	AL3	x_{21}	AW3/AW4
x_2	CL	x_{12}	AL4	x_{22}	AW1/AW3
x_3	AW1	x_{13}	AL5	x_{23}	AW2/AW3
x_4	AW2	x_{14}	AW1/AW5	x_{24}	AW1/AW2
x_5	AW3	x_{15}	AW2/AW5	x_{25}	S1
x_6	AW4	x_{16}	AW3/AW5	x_{26}	S2
x_7	AW5	x_{17}	AW4/AW5	x_{27}	S3
x_8	AL	x_{18}	AL/AW5	x_{28}	S4
x_9	AL1	x_{19}	AW1/AW4	x_{29}	S5
x_{10}	AL2	x_{20}			

2. The model for predicting sex with unknown AL1-5.

(1) For stage C1:

$$\ln\frac{\pi}{1-\pi} = -0.0244136 + 0.2284x_1 - 0.498856x_2 - 6.93177x_3 + 2.42147x_4 - 0.901938x_5 +$$
$$6.38174x_6 - 0.820575x_7 - 1.23523x_8 + 15.3443x_9 - 7.7136x_{10} - 4.54746x_{11} - 4.02716x_{12} +$$
$$1.41411x_{13} - 8.52238x_{14} + 5.59664x_{15} + 4.18893x_{16} - 1.39447x_{17} + 0.533026x_{18} +$$
$$0.973405x_{19}$$

(2) For stage C2:

$$\ln\frac{\pi}{1-\pi} = 0.029692 - 0.34094x_1 + 0.034987x_2 - 4.8149x_3 + 6.8628x_4 - 2.9119x_5 - 3.6278x_6 +$$
$$9.969x_7 - 8.476x_8 + 9.8831x_9 - 7.6355x_{10} + 0.79347x_{11} + 2.2614x_{12} + 7.2655x_{13} -$$
$$4.0137x_{14} + 2.0333x_{15} + 1.2908x_{16} - 0.050949x_{17} - 2.9826x_{18} - 2.3263x_{19}$$

(3) For stage C3:

$$\ln\frac{\pi}{1-\pi} = -0.057822 + 0.4933x_1 - 0.15043x_1 - 1.1758x_3 + 5.0051x_4 - 2.3085x_5 - 3.1485x_6 +$$
$$1.7825x_7 + 0.020725x_8 - 0.28746x_9 + 0.036256x_{10} + 0.036346x_{11} - 0.031007x_{12} +$$
$$0.19705x_{13} - 0.0035409x_{14} - 4.7389x_{15} + 3.1897x_{16} + 2.4057x_{17} - 0.22959x_{18} + 1.2057x_{19}$$

(4) For stage C4:

$$\ln\frac{\pi}{1-\pi} = -0.24719 + 0.13775x_1 + 0.051487x_2 + 1.1892x_3 - 0.474x_4 + 0.55948x_5 +$$
$$0.88244x_6 + 0.6407x_7 - 3.367x_8 + 0.084921x_9 + 0.31165x_{10} + 0.16116x_{11} + 0.24043x_{12} -$$
$$0.10469x_{13} - 3.6367x_{14} + 0.5575x_{15} + 2.2632x_{16} - 1.2157x_{17} + 2.04x_{18} + 3.1261x_{19}$$

(5) For stage C5::

$$\ln\frac{\pi}{1-\pi} = 0.040689 - 0.060027x_1 - 0.020344x_2 + 1.4186x_3 - 2.1859x_4 + 0.39688x_5 +$$
$$0.05796x_6 + 1.1795x_7 - 1.4521x_8 + 0.2771x_9 + 0.18922x_{10} + 0.48157x_{11} + 0.027118x_{12} -$$
$$0.4052x_{13} - 0.99115x_{14} + 1.6572x_{15} - 0.50695x_{16} - 1.1809x_{17} + 1.2875x_{18} - 0.39465x_{19}$$

Table S2. Variable and corresponding element used with unknown AL1-5.

Variable	Element	Variable	Element
x_1	FCW	x_{11}	AW3/AW5
x_2	CL	x_{12}	AW4/AW5
x_3	AW1	x_{13}	AL/AW5
x_4	AW2	x_{14}	AW1/AW4
x_5	AW3	x_{15}	AW2/AW4
x_6	AW4	x_{16}	AW3/AW4
x_7	AW5	x_{17}	AW1/AW3
x_8	AL	x_{18}	AW2/AW3
x_9	AW1/AW5	x_{19}	AW1/AW2
x_{10}	AW2/AW5		

Note: All data have been normalized using Z-Score normalization:

$$x_{normalized} = \frac{x - \mu}{\sigma}$$

μ：Mean; σ：Standard Deviation