

Supplementary Table S1. The LWDS factor structure in different studies

Country where study was conducted	Lebanon*	Iran	Egypt	Turkey	Jordan	The United Kingdom
Acronym	LWDS-11	Not available	E8-LWDS	LWDS-TR	LWDS-10J	Not available
Analysis methods	EFA	CFA	EFA & CFA	EFA & CFA	EFA & CFA	EFA
Sample size	291 (103/188)	465	1490	401	2577	180
Sample description	Current exclusive waterpipe smokers (>1 waterpipe/2 weeks) Males & females (33.0%/39.9%) Mean age 29.7/36.2	Current waterpipe smokers (any WTS in past month) Males & females (73.7%) Age range 15-54	Current waterpipe smokers (any WTS in past-30 days) Non-exclusive WTS included Males & females (8.7%) Age range 18-87	Current waterpipe smokers (≥1 waterpipe/2 weeks) Dual waterpipe & cigarette smokers included Males & females (28.2%) Age range 18-62	Ever waterpipe smoker university students Males & females (56%) Mean age 21.2	Waterpipe smokers (any WTS in past year) Males only Mean age 29.5
Place of conduction	Urban Beirut cafés	Urban Tehran	Rural Menoufia & urban Cairo cafés, households, workplaces, & universities	Urban Ankara waterpipe serving establishments & social media	Public & private universities	Urban London cafés
Sampling method	Convenience/random digital dialing	Random	Purposive quota representing national proportions of age, gender, residence, & WTS	Non-random	Random	Non-random
Number of factors extracted	4	4	3	2	3	2
Number of items included	11	11	8	9	10	10
1. Number of times you could stop waterpipe for >7 days?	Physiological nicotine dependence	Physiological nicotine dependence	Physical dependence	Physiological dependence	Physical dependence	Physiological dependence
2. Percent of income you would spend on waterpipe smoking?	Physiological nicotine dependence	Physiological nicotine dependence	Not included	Physiological dependence	Physical dependence	Physiological dependence
3. Number of days you could spend without waterpipe?	Physiological nicotine dependence	Physiological nicotine dependence	Physical dependence	Physiological dependence	Physical dependence	Physiological dependence
4. Number of waterpipes you usually smoke per week?	Physiological nicotine dependence	Physiological nicotine dependence	Physical dependence	Physiological dependence	Physical dependence	Physiological dependence
5. Do you smoke waterpipe to relax your nerves?	Negative reinforcement	Negative reinforcement	Psychological dependence	Psychological dependence	Relaxation/ pleasure	Post/neg reinforcement
6. Do you smoke waterpipe to improve your morale?	Negative reinforcement	Negative reinforcement	Psychological dependence	Psychological dependence	Psychosocial	Post/neg reinforcement
7. Do you smoke waterpipe when you are seriously ill?	Psychological craving	Psychological craving	Psychological craving	Physiological dependence	Physical dependence	Physiological dependence
8. Do you smoke waterpipe alone?	Psychological craving	Psychological craving	Not included	Physiological dependence	Physical dependence	Physiological dependence
9. Are you ready not to eat in exchange for a waterpipe?	Psychological craving	Psychological craving	Psychological craving	Physiological dependence	Not included	Not included
10. Do you smoke waterpipe for pleasure?	Positive reinforcement	Positive reinforcement	Psychological Dependence	Not included	Relaxation/ pleasure	Post/neg reinforcement
11. Do you smoke to please others (conviviality)?	Positive reinforcement	Positive reinforcement	Not included	Not included	Psychosocial	Post/neg reinforcement
Total scale reliability	0.83/0.70	Not applicable	0.64	0.8	0.77	0.74
Subscale reliability (min, max)	0.55/0.42, 0.88/0.69	Not applicable	0.65, 0.82	0.81, 0.82	0.67, 0.75	0.50, 0.80
Total % of variance explained	68.97/not mentioned	Not applicable	71.8	59	Not mentioned	47.8

EFA, Exploratory factor analysis; CFA, Confirmatory factor analysis; WTS, waterpipe tobacco smoking

*Sample 1/Sample 3. (%) represent proportion of females in the study sample.

Different cell shade by the same colour (i.e. light and dark blue; light and dark yellow; light and dark gray) indicates different factor labelling or different item subscale assignment.

Supplementary Table S2. Exploratory factor analysis, factor loadings, and structure of the E8-LWDS among exclusive and non-exclusive current waterpipe smokers

			E8-LWDS factor loadings and subscale assignment in Exclusive WTS (n=777)					E8-LWDS factor loadings and subscale assignment in Non-exclusive WTS (n=713)				
	Items retained from the original LWDS-11	LWDS-11 original subscale assignment	1*	2*	3*	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	1*	2*	3*	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Number of times you could stop waterpipe for >7 days	1	0.846			0.412	0.578	0.814			0.411	0.532
3	Number of days you could spend without waterpipe	1	0.902			0.419	0.582	0.926			0.423	0.531
4	Number of water pipes you usually smoke per week	1	0.854			0.338	0.606	0.885			0.311	0.567
5	Do you smoke waterpipe to relax your nerves	2		0.741		0.358	0.596			0.710	0.231	0.592
6	Do you smoke waterpipe to improve your morale	2		0.818		0.386	0.587			0.787	0.392	0.536
7	Do you smoke waterpipe when you are seriously ill	3			0.882	0.113	0.651		0.924		0.274	0.577
9	Are you ready not to eat in exchange for a waterpipe	3			0.859	0.27	0.618		0.927		0.268	0.577
10	Do you smoke waterpipe for pleasure	4		0.768		0.354	0.596			0.713	0.128	0.619
	Eigen values		2.428	1.790	1.445			2.408	1.891	1.475		
	% Variance explained by factor		30.352	22.377	18.065			30.106	23.641	18.440		
	Total Variance explained by model		70.794					72.187				
	Cronbach's alpha for factors		0.823	0.676	0.692			0.846	0.833	0.585		
	Cronbach's alpha for total scale		0.635					0.600				

WTS, waterpipe tobacco smoking; Non-exclusive WTS, waterpipe tobacco smoking and/or cigarette smoking and/or electronic nicotine delivery systems use

* Factor 1: physical dependence, Factor 2: psychological dependence, and Factor 3: psychological craving.

Supplementary Table S3. Differentiation between exclusive and non-exclusive waterpipe tobacco smokers (median test)

	Total sample (N=1490)		Exclusive WTS (N=777)		Non-exclusive WTS (N=713)	
	Non-heavy smoker	Heavy smoker	Non-heavy smoker	Heavy smoker	Non-heavy smoker	Heavy smoker
Hagar (tobacco portion) smoked per day (number)	<8	≥8	<8	≥8	<8	≥8
	n=964	n=526	n=476	n=301	n=488	n=223
E8-LWDS mean (SD) ^a	13.0 (4.0)	15.2 (2.7)	13.2 (3.9)	15.4 (2.8)	12.8 (4.1)	15.0 (2.6)
E8-LWDS median (IQR)	13.0 (10.0-15.0)	15.0 (13.0-17.0)	13.0 (11.0-15.0)	15.0 (13.0-18.0)	13.0 (10.0-16.0)	15.0 (13.0-17.0)
Percentage above median hagar/day ^{b*}	35.2	61.8	35.1	62.5	35.2	61.4
Percentage above E8-LWDS score 14 ^{c*}	45.9	72.4	48.3	72.4	43.4	72.4
	Non-heavy smoker	Heavy smoker	Non-heavy smoker	Heavy smoker	Non-heavy smoker	Heavy smoker
Waterpipes smoked per week (number)	<7	≥7	<7	≥7	<7	≥7
	n=279	n=1211	n=101	n=676	n=178	n=535
E8-LWDS mean (SD) ^a	9.9 (3.8)	14.7 (3.1)	9.4 (4.0)	14.7 (3.1)	10.1 (3.7)	14.6 (3.1)
E8-LWDS median (IQR)	10.0 (7.0-12.0)	15.0 (16.0-17.0)	9.0 (7.0-12.5)	15.0 (13.0-17.0)	10.0 (8.0-12.0)	15.0 (12.0-17.0)
Percentage above median waterpipes/week ^{b*}	11.1	52.3	11.9	50.7	10.7	54.2
Percentage above E8-LWDS score 14 ^{c*}	15.4	64.4	14.9	64.1	15.7	64.9

WTS, waterpipe tobacco smoking; Non-exclusive WT use, waterpipe tobacco smoking and/or cigarette smoking and/or electronic nicotine delivery systems use

^a Independent samples T-test

^b Median nonparametric test

^c Chi-squared test

*All p-values were <0.001