Supplementary Material

Statistical analysis

Posterior-probability proportional assignment was used to relate the latent classes to cannabis dependence. For example, if a respondent was estimated a probability of 0.9 of being classified in Class 1 and 0.1 in Class 2, they were assigned a value of 0.9 and 0.1 in classes 1 and 2 respectively and 0 for the remaining classes. Whilst this approach is favourable to the modal assignment method (i.e. assigning individuals to their most likely class with a value of 1, and 0 for the remaining classes); standard errors of regression coefficients may still be biased due to the uncertainty in the estimation of posterior probabilities (Clark and Muthén, 2009). However, methods developed to incorporate this uncertainty into model estimation (e.g. the BCH method;(Bakk and Vermunt, 2016) are liable to producing inadmissible results when entropy is low and when there is substantial difference between the variances across classes (Asparohov and Muthén, 2014). Also, the reliability of this approach has only been assessed in simulation studies using comparatively small sample sizes with few latent classes and covariates (Asparohov and Muthén, 2014; Bakk and Vermunt, 2016). Therefore, given the large sample size, and the complexity of the model estimated, we opted for the probability regression method. However, to ensure that model results were reliable and did not substantively change across different methods, we repeated the analysis using the modal assignment method (Supplementary Table 2).

Table S1. *Fit statistics for the 1-9 latent class models of type of cannabis use in past 12 months.*

No. of classes	AIC	BIC	Adjusted BIC	Entropy
1	364585.265	364638.782	364619.713	-
2	342535.986	342651.939	342610.624	0.69
3	336722.971	336901.360	336837.800	0.73
4	335808.001	336048.826	335963.019	0.65
5	334610.296	334913.557	334805.505	0.82
6	333973.889	334339.586	334209.287	0.72
7	**333570.339**	**333998.473**	**333845.928**	**0.77**
8	333402.717	333893.287	333718.496	0.81
9	333293.584	333846.589	333649.552	0.73

Note: Preferred solution is in bold. AIC, Akaike information criterion; BIC, Bayesian information criterion.

Figure S1. *Plot of information criterion values across latent class solutions*

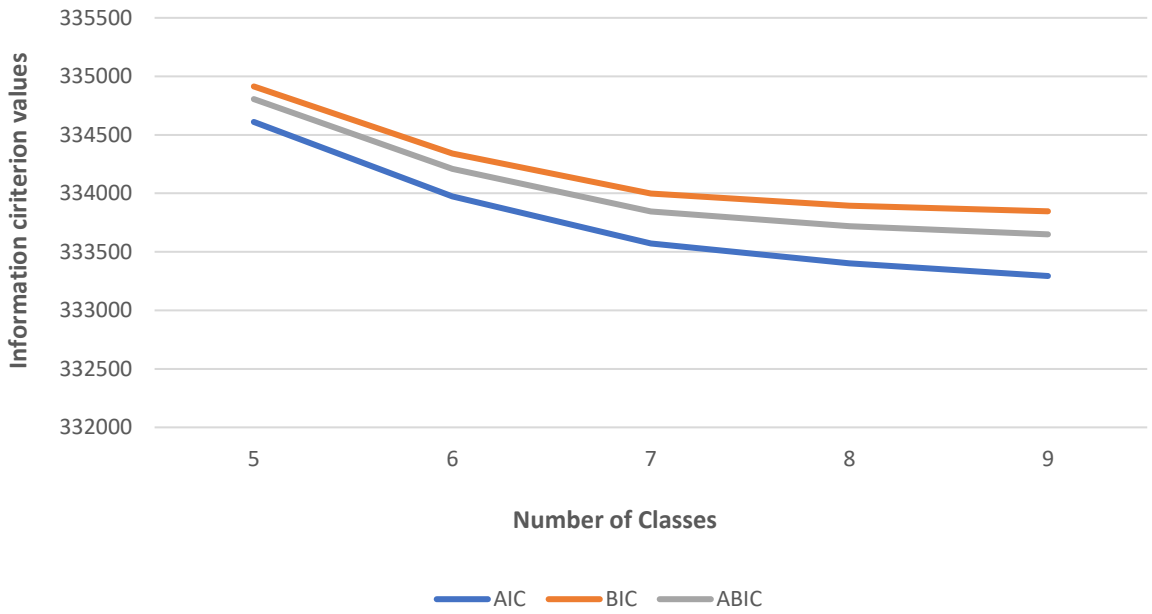


Figure S2. *Changes in most probable latent class assignment in 7-9 class solutions.*

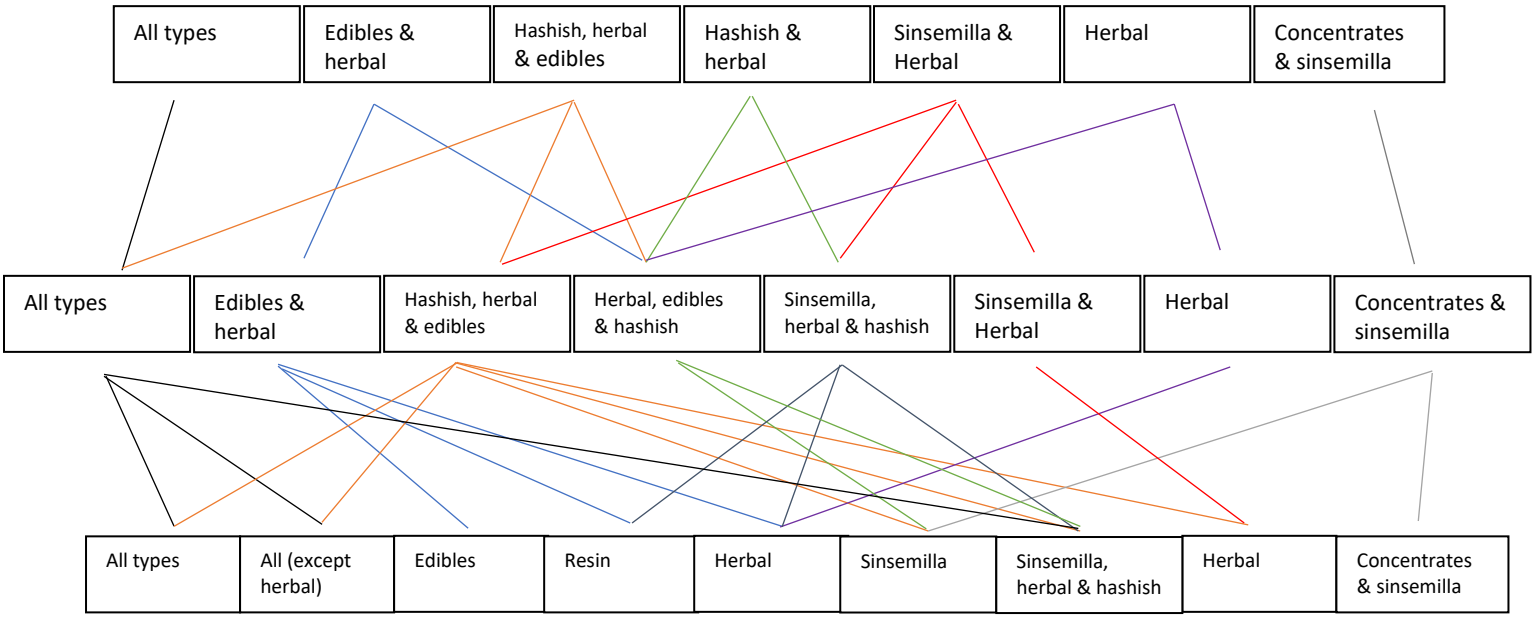


Table S2. *Associations between latent class analysis of multiple cannabis product use and severity of dependence on cannabis using the modal assignment method (see Figure S3. for Beta and 95% CI for latent classes displayed in a caterpillar plot)*

Variable	Category	B	Beta	P Value	95% CI
Latent Class	Herbal	Ref.			
	Sinsemilla & herbal	0.168	0.031	<0.001	0.118 – 0.215
	Sinsemilla, herbal & hashish	0.326	0.054	<0.001	0.259 – 0.394
	Hashish & herbal	0.307	0.049	<0.001	0.249 – 0.368
	All types	0.130	0.012	0.011	0.019 – 0.246
	Edibles & herbal	0.024	-0.002	0.651	-0.051 – 0.107
	Concentrates & sinsemilla	-0.007	-0.0003	0.931	-0.157 – 0.157
Age	20-24	Ref.			
	16-19	-0.021	-0.004	0.417	-0.072 – 0.030
	25-29	-0.117	-0.018	<0.001	-0.176 – -0.058
	30+	-0.349	-0.057	<0.001	-0.406 – -0.293
Gender	Male	Ref.			
	Female	-0.003	-0.0004	0.910	-0.046 – 0.041
	Other	0.435	0.018	<0.001	0.222 – 0.655
Frequency of use	<Monthly	Ref.			
	Monthly or more (<weekly)	0.519	0.060	<0.001	0.461 – 0.577
	Weekly or more (<daily)	1.458	0.259	<0.001	1.410 – 1.506
	Daily or near daily	2.848	0.514	<0.001	2.786 – 2.911
Amount used per occasion (g)		0.091	0.030	<0.001	0.056 – 0.129
Mix with tobacco		0.372	0.070	<0.001	0.331 – 0.411

B, unstandardized linear regression coefficients; Beta, standardized linear regression coefficients; CI, 95% bias corrected confidence intervals.

Figure S3. *Caterpillar plot displaying linear regression coefficients and bias corrected 95% CI for associations with dependence severity for latent class (compared to the Herbal class) for modal assignment method, adjusted for age, gender, frequency of use, amount used per session, and mixing with tobacco (as reported in table S2).*

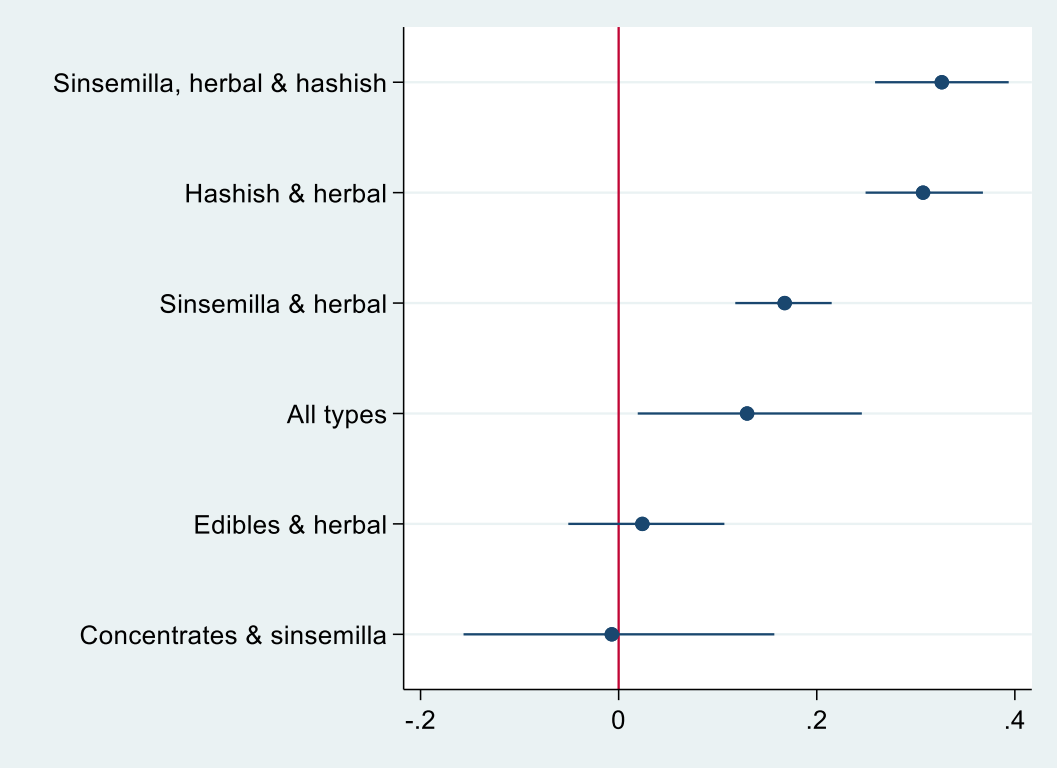


Table S3. *Associations between latent class analysis of multiple cannabis product use and severity of dependence on cannabis including ethnicity and education as covariates* (n= 32, 550) *(see Figure S4. for Beta and 95% CI for latent classes displayed in a caterpillar plot).*

Variable	Category	B	Beta	P Value	95% CI
Latent Class	Herbal	Ref.			
	Sinsemilla & herbal	0.117	0.018	0.001	0.057 – 0.178
	Sinsemilla, herbal & hashish	0.410	0.053	<0.001	0.318 – 0.502
	Hashish & herbal	0.208	0.023	<0.001	0.124 – 0.293
	All types	0.062	0.005	0.394	-0.107 – 0.231
	Edibles & herbal	-0.023	-0.002	0.709	-0.109 – 0.065
	Concentrates & sinsemilla	0.024	0.001	0.829	-0.196 – 0.263
Age	20-24	Ref.			
	16-19	-0.153	-0.029	<0.001	-0.215 – -0.087
	25-29	-0.079	-0.013	0.022	-0.148 – -0.010
	30+	-0.329	-0.059	<0.001	-0.397 – -0.264
Gender	Male	Ref.			
	Female	-0.036	-0.007	0.168	-0.086 – 0.015
	Other	0.500	0.022	<0.001	0.244 – 0.761
Frequency of use	<Monthly	Ref.			
	Monthly or more (<weekly)	0.521	0.064	<0.001	0.455 – 0.586
	Weekly or more (<daily)	1.424	0.262	<0.001	1.367 – 1.479
	Daily or near daily	2.801	0.511	<0.001	2.724 – 2.877
Amount used per occasion (g)		0.087	0.024	<0.001	0.042 – 0.136
Mix with tobacco		0.390	0.078	<0.001	0.342 – 0.435
Education	College Diploma	Ref.			
	Lower Secondary or Less	0.240	0.039	<0.001	0.162 – 0.318
	Technical/Trade Certificate	-0.145	-0.018	0.001	-0.234 – -0.054
	Higher Secondary	0.104	0.018	0.002	0.034 – 0.171
	Degree	-0.017	-0.003	0.630	-0.081 – 0.050
	Higher Degree	0.015	0.001	0.784	-0.090 – 0.119
Ethnicity	White	Ref.			
	Other	0.180	0.023	<0.001	0.097 – 0.265

B, unstandardized regression coefficients; Beta, standardized regression coefficients; CI, 95% bias corrected confidence intervals.

Figure S4. *Caterpillar plot displaying linear regression coefficients and bias corrected 95% CI for associations with dependence severity for latent class (compared to the Herbal class) with ethnicity and education included as covariates, in addition to age, gender, frequency of use, amount used per session, and mixing with tobacco (as reported in Table S3).*

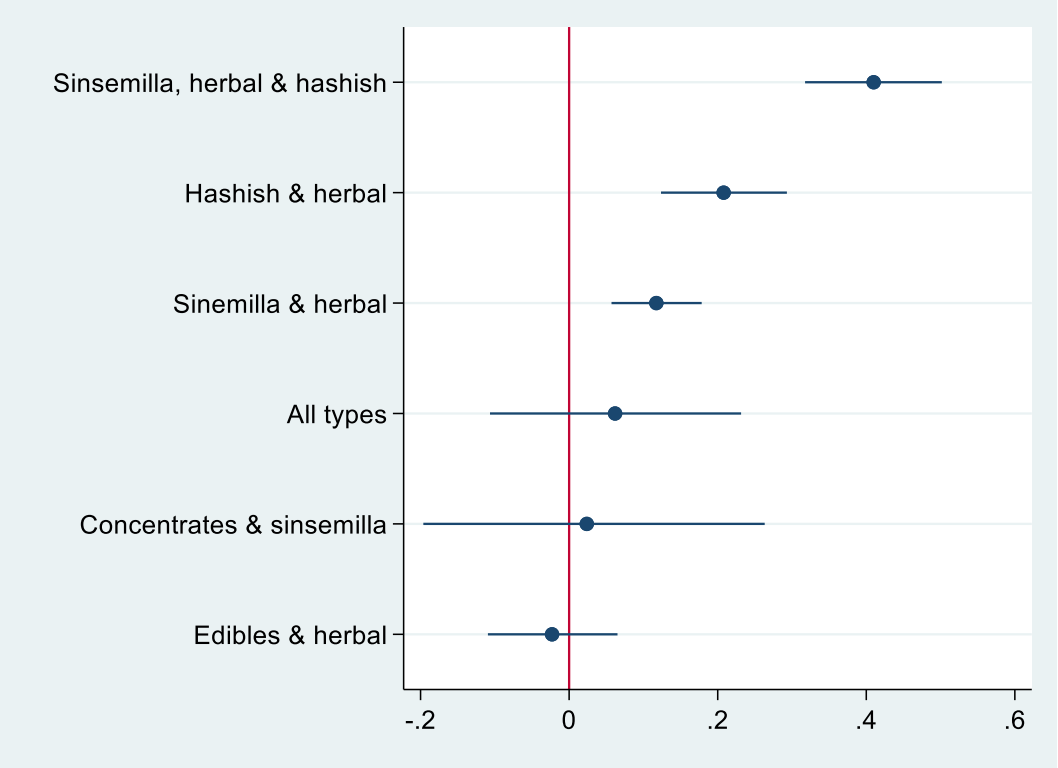


Figure S5. *Latent class membership for the six countries with the most respondents: Germany (30% of the sample). Cannabis legal status: Illegal*

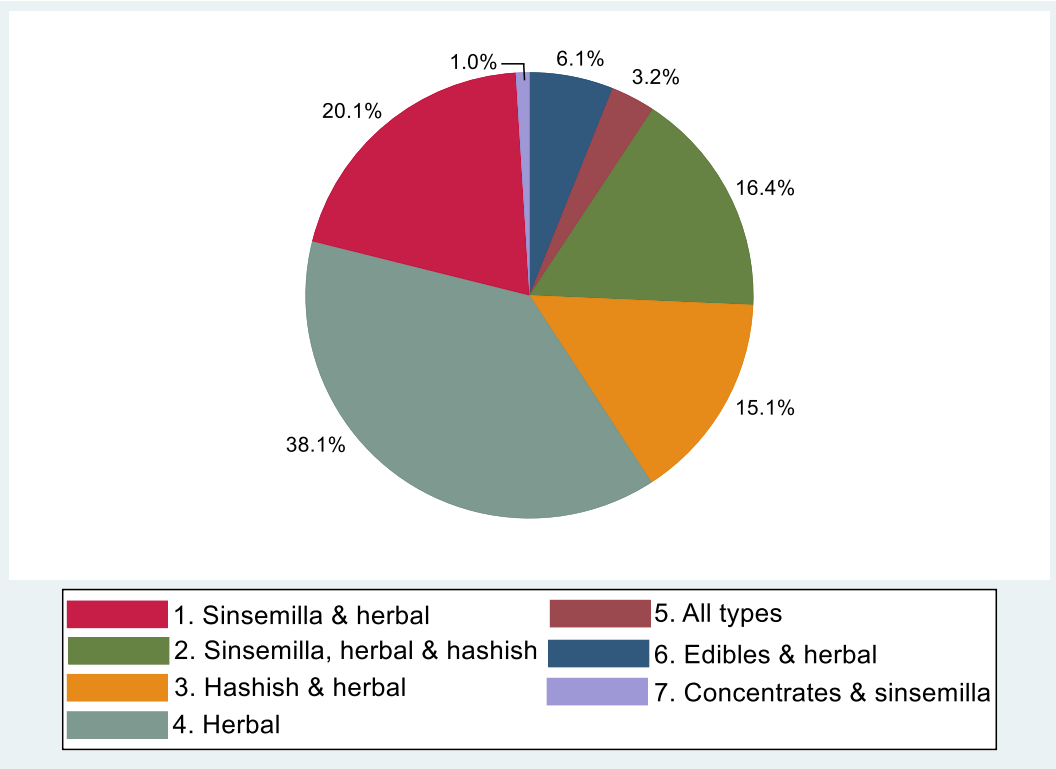


Figure S6. *Latent class membership for the six countries with the most respondents: Denmark (9.5%). Cannabis legal status: Illegal*

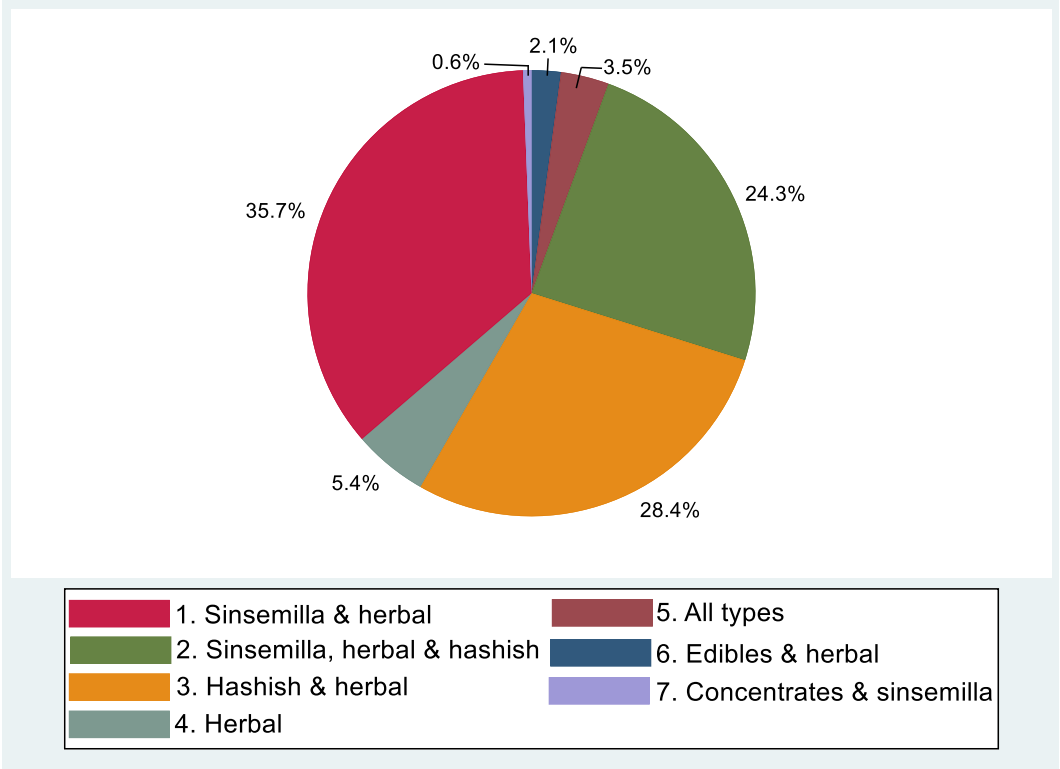


Figure S7. *Latent class membership for the six countries with the most respondents: Poland (7.9%). Cannabis legal status: Illegal*

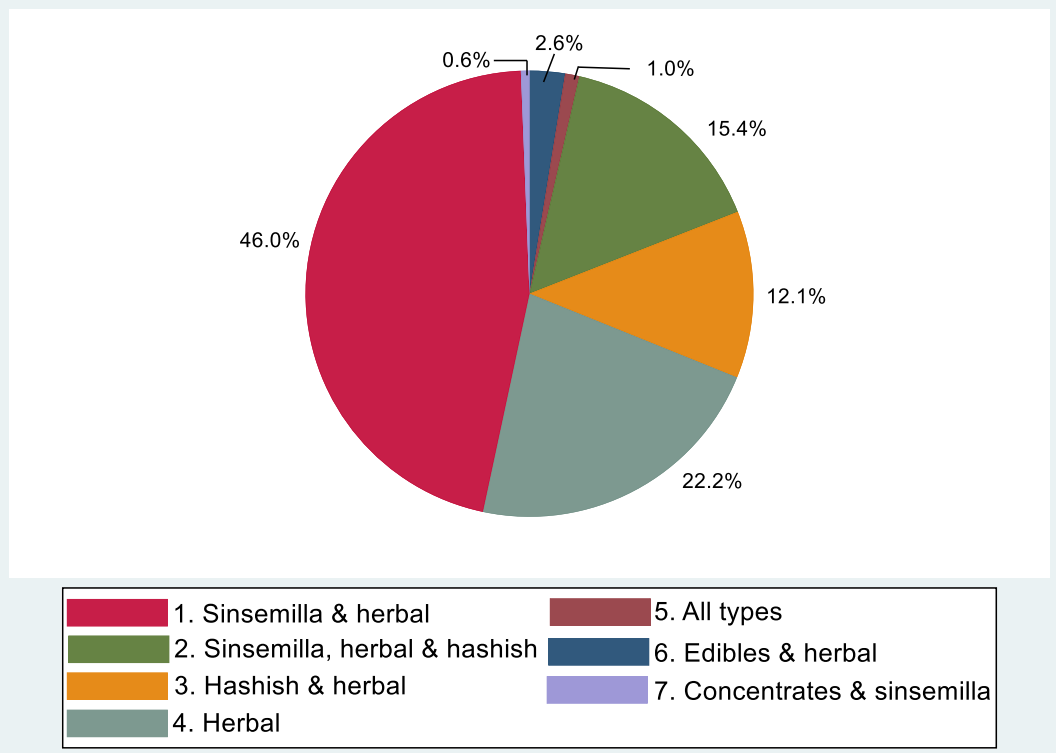


Figure S8. *Latent class membership for the six countries with the most respondents: USA (6.7%). Cannabis legal status: Legal in certain states*

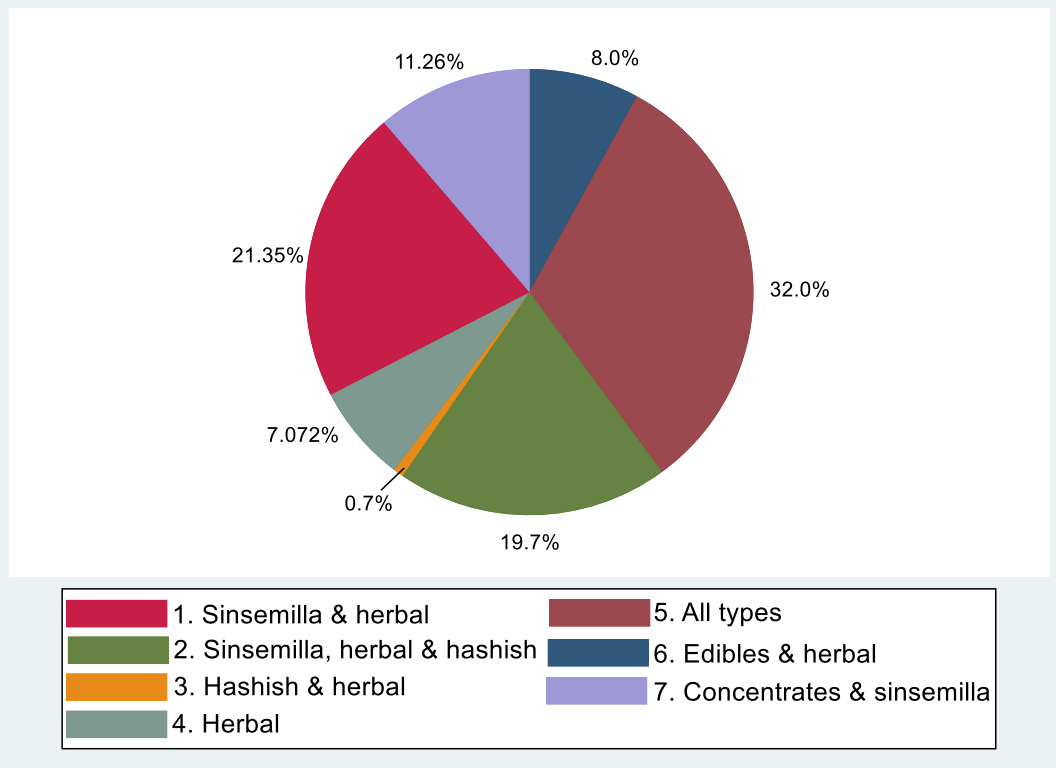


Figure S9. *Latent class membership for the six countries with the most respondents: Switzerland (3.9%). Cannabis legal status: Illegal*

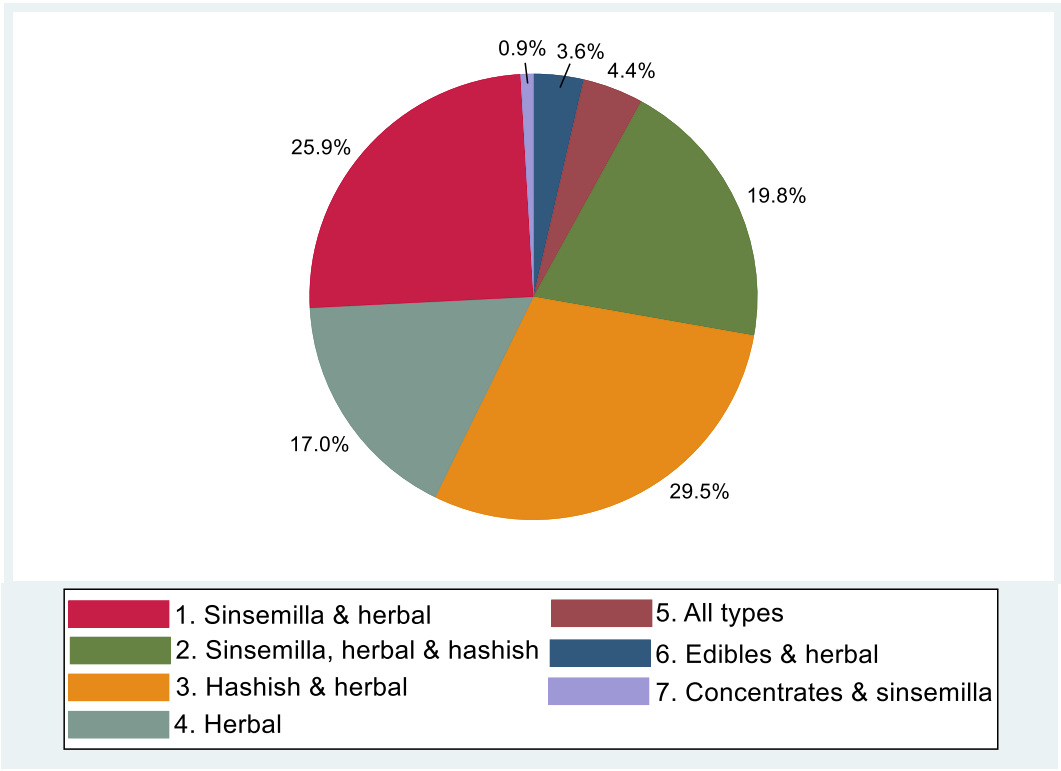
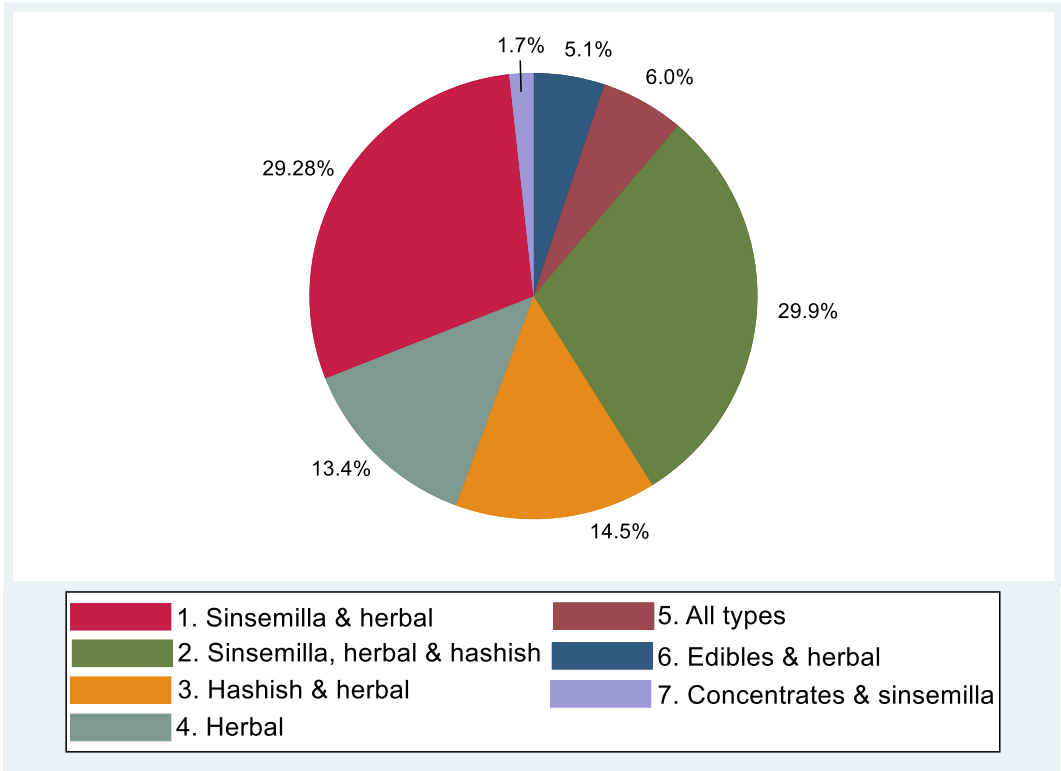


Figure S10. *Latent class membership for the six countries with the most respondents: U.K. (3.6%). Cannabis legal status: Illegal*



Supplementary References

Asparohov, T., Muthén, B., 2014. Auxiliary Variables in Mixture Modeling: Using the BCH Method in Mplus to Estimate a Distal Outcome Model and an Arbitrary Secondary Model. Mplus Web Notes.

Bakk, Z., Vermunt, J.K., 2016. Robustness of Stepwise Latent Class Modeling With Continuous Distal Outcomes. Structural Equation Modeling: A Multidisciplinary Journal 23, 20-31.