What are the costs of mandatory cannabis testing?
Evaluating the impact of contaminant testing regulations in the California cannabis market

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Cannabis sold legally within California is governed by regulations that require that any batches released for retail sales first pass a set of laboratory tests. These testing regulations are part of a large package that regulates cultivation, manufacturing, distribution, and retailing. It is important to understand the costs of supplying cannabis that has passed stringent tests relative to the value-added because it is and is perceived to be a safer product. This study is the first to comprehensively examine the economic challenges of testing cannabis set by the new regulatory framework.

Figure 1 shows the flow of testing cannabis in California, and describes the mandatory testing for specific types of products. Dried flowers and cannabis products must be tested for various contaminants to enter the legal market.

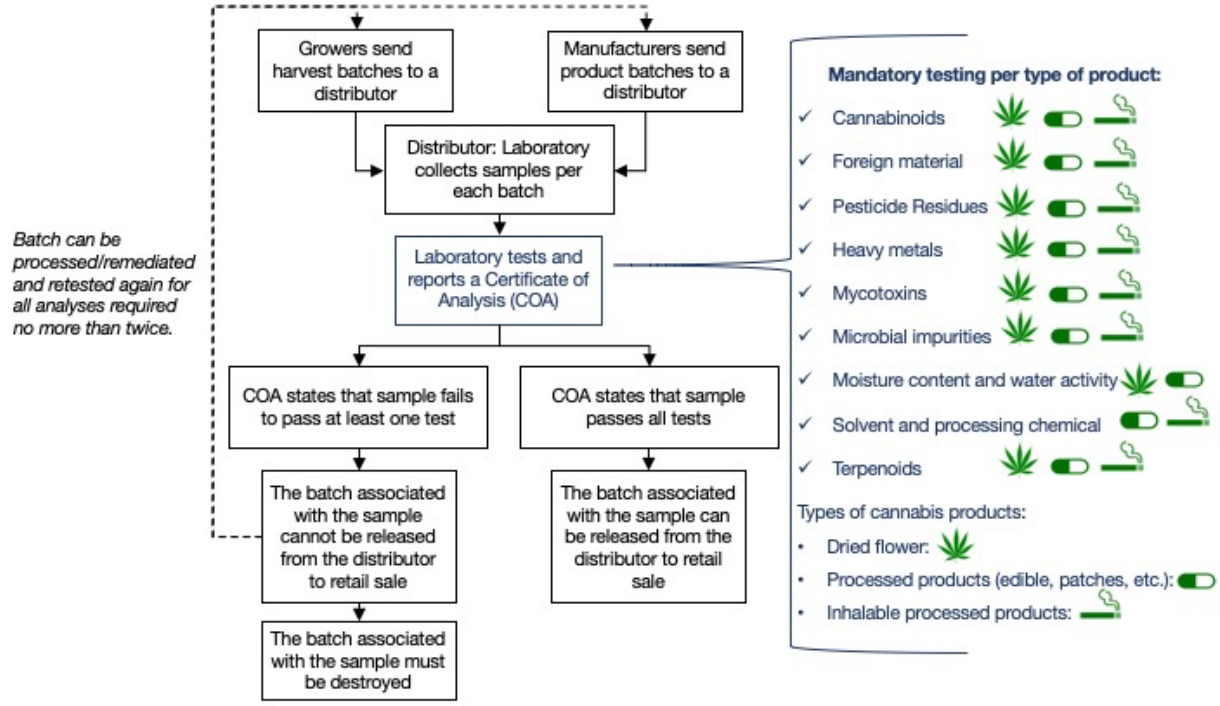

Figure 1: Scheme for California's testing regime of cannabis.

We collect data to construct in-depth estimates of the capital, fixed, and variable costs required to run a licensed testing lab in California. (e.g., information on testing equipment used and their costs, maintenance lab equipment and facilities, real estate prices, labor costs, etc.)

We use 1,000 Monte Carlo simulations to evaluate distribution of fixed and variable costs along with the testing capacities of each lab. We then estimate sampling and testing cost per sample from a typical batch of dried cannabis flower.

We base our simulations on the number and geographical location of licensed testing labs (n=49) and distributors (n=1,210) listed by the Bureau of Cannabis Control in April of 2019 (Figure 2).

We expect that 70%, 20%, and 10% of the labs are distributed into small, medium, and large size categories.

For simplicity, we assume that testing labs use the same inputs, but combined in different proportions to provide testing services.

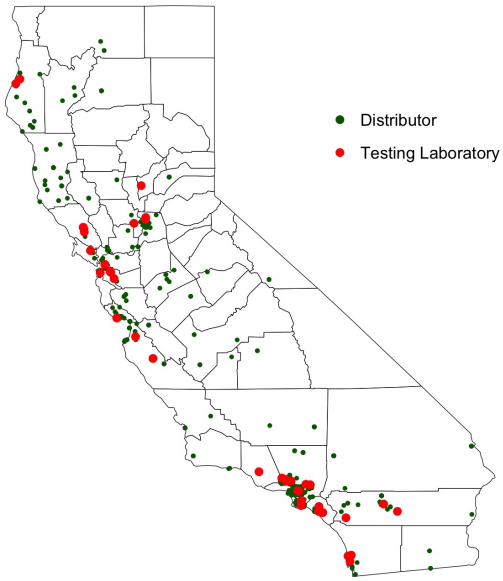

Figure 2. Locations of licensed testing labs and distributors in California (Source Bureau of Cannabis Control, April of 2019)

Figure 3 shows simulated sampling costs per sample at different distances between labs and distributors in three lab scales. This figure shows that the cost of sampling depends on how far is the distributor from the lab. Table 1 summarizes the average of 1,000 simulations for 49 labs on their testing capacities, annualized capital costs, and other annual expenses in three lab scales.

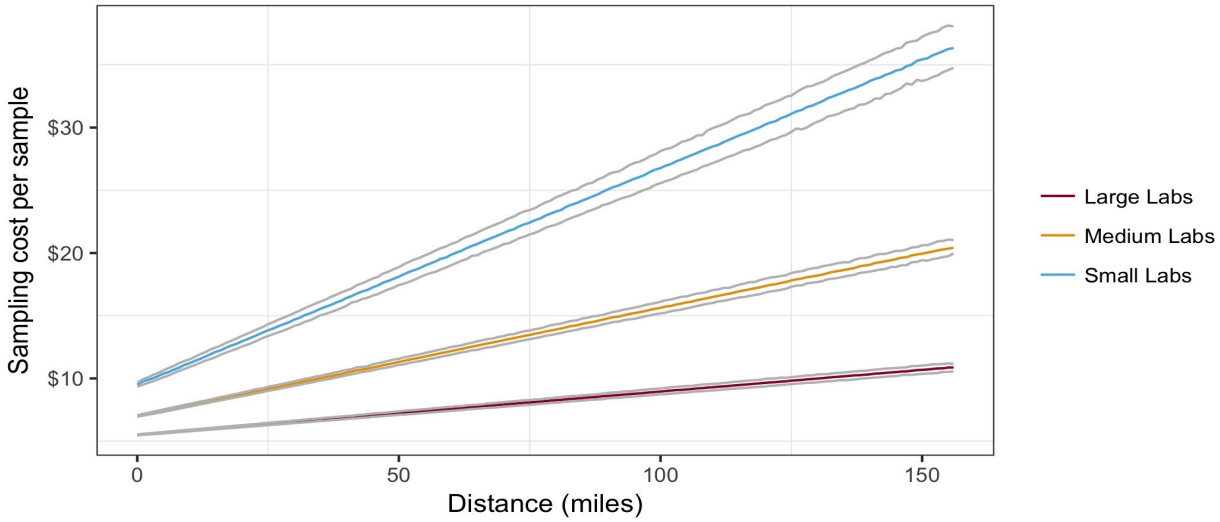

Figure 3: Sampling cost at different distances from a lab to a distributor

To account for the annual cost of investment we use a discount rate of 7.5% per year that reflects the combined effects of depreciation and interest over a 10-year horizon. The scale advantages of larger testing labs are caused by more effective use of lab space, equipment, and labor. Large testing labs process about 10 times the number of samples as a small lab, with annualized operating costs about five times of those small labs.

Table 1. Itemized costs by lab scale

	Large	**Medium**	**Small**
Mean number of effective samples analyzed year	23,312	5,895	2,173
Annual operating costs	*(Thousands)*		
Capital investment, interest plus depreciation[1]	$562.02	$378.87	$235.38
Equipment maintenance and acquisition and maintenance of ISO/IEC-17025	$615.76	$422.16	$233.07
Rent and basic utilities costs	$484.95	$332.71	$228.40
Sales, general and administrative costs	$129.96	$88.01	$49.99
License fees	$90.00	$45.00	$20.00
Labor	$1,721.89	$895.77	$518.68
Consumable costs	$3,430.88	$866.90	$319.36
Return to risk and profit (15%)	$84.30	$56.83	$35.31
Total for the laboratory	$7,119.77	$3,086.25	$1,640.18
	Costs per sample tested		
Average cost per sample of within lab testing	$305	$524	$755
Cost of collection, transport and handling	$8	$12	$20
Average cost per sample of testing	$313	$536	$775

We estimate a weighted average of cost of testing of $502 per sample as we expect that that small labs will test about 30% of all legal cannabis in the state by volume, medium-sized labs will test about 24% of legal cannabis, and large labs will test 47% of legal cannabis.

Next, we translate the per sample cost to a per pound cost of cannabis marketed, which depends on:

- The number of pounds tested in each test and costs of security compliance (about $3.62 per pound).
- The costs of cannabis lost during testing, and the cost of cannabis destroyed because it fails testing.

Table 2 shows costs per pound of cannabis marketed in three components: 1) the laboratory; 2) the value of lost inventory (opportunity cost of cannabis rejected); and 3) the relatively small cost of remediation of batches that failed the first time (See figure 1).

Table 2. Itemized costs of testing under different rejection-rate and batch-size assumptions

Rejection Rate	Batch Size	Laboratory Cost	Inventory Lost	Remediation Cost	Total
7.0%	5	$144.55	$81.81	$0.74	$227.10
7.0%	25	$32.83	$81.81	$0.74	$115.38
7.0%	50	$18.87	$81.81	$0.74	$101.42
12.5%	5	$154.37	$147.58	$1.38	$303.33
12.5%	25	$35.06	$147.58	$1.38	$184.03
12.5%	50	$20.15	$147.58	$1.38	$169.11
25.0%	5	$180.38	$321.90	$3.08	$505.36
25.0%	25	$40.97	$321.90	$3.08	$365.95
25.0%	50	$23.54	$321.90	$3.08	$348.52

Cannabis destroyed because it fails testing is a potentially important cost. Batch size is limited to 50 pounds and wholesale value is in the range of $1,000 per pound (dried flower-equivalent basis). We estimate the full cost of testing expressed as dollars of testing per unit of legal cannabis marketed.

Costs associated with failure to pass the test are a large element of full costs. This item comprises costs to remediate (if possible), cost of re-testing, and the value of cannabis that must be destroyed. We found that when batch sizes are small laboratory testing costs a large share of costs, especially when rejection rates are low. With larger batch sizes and higher rejection rates, the costs of destroyed cannabis looms large.

This study promotes a discussion on the effects of the testing regimes on retail prices. This is a common issue for food products and is particularly interesting in a new industry such as legal-regulated cannabis. Understanding the cost structure of testing cannabis is crucial to compare value created for consumers versus the associated costs of these regulations.

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