ChatGPT

Sober-Body™ — A Real-Time Alcohol Harm-Reduction Companion

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1. Executive Summary

Sober-Body™ is a cross-platform mobile/PWA companion that delivers **live Blood-Alcohol Concentration (BAC)** estimates, empathic warnings, and actionable recovery guidance with **one-tap drink logging**. A unique **Group Mode** leverages peer accountability at social events, while **mini-games** detect unlogged drinks through rapid cognitive tests. Optional pairing with Bluetooth breathalyzers and wearables allows personalisation and early detection of dependence risk.

Our goal is to **reduce alcohol-related harm**—impaired driving, binge episodes, and emerging dependence—by transforming complex physiology into clear, real-time decisions.

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2. Problem Statement

- Existing BAC calculators are accurate on paper but demand tedious data entry; compliance plummets after the second drink.
- Mindful-drinking apps excel at behaviour change content yet lack real-time safety cues.
- No mainstream product visualises **metabolite burden** (acetaldehyde) or blends **sensor data** (HRV, breathalyzers) with validated screening (AUDIT).
- Social influence—a proven moderator of drinking—rarely features in current apps.

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3. Opportunity & Market Gap

Dimension	Current State	Gap / Opportunity
Input friction	Multi-step forms; manual units	⇨ One-tap buttons & sliders
Personalisation	Fixed Widmark constants	⇨ β calibrated via breathalyzer & vitals
Harm-reduction cues	Generic "sober by" timer	⇨ Region-aware legal limits, ride-share links, hangover forecast
Dependence alerts	Rare	⇨ Rule-engine + AUDIT push
Social layer	Absent	⇨ Party-table dashboard & peer nudges

The TAM spans *120 M drinking-age adults* in North America and EU; early adopters include tech-savvy social drinkers and health-conscious professionals.

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4. Solution Overview

4.1 User Personas

1. **Casual Night-Out User ("Alicia, 27")** – wants a quick "safe-to-drive" check.
2. **Mindful Improver ("Ben, 35")** – tracks weekly units, aims to cut back.
3. **Health Hacker ("Chris, 40")** – owns a Breathalyzer & Garmin watch; loves data.
4. **Party Host ("Dana, 30")** – uses Group Mode to keep friends safe.

4.2 Value Proposition

- **Speed:** log a drink in <1 s.
- **Safety:** live BAC gauge, ride-share nudges, dehydration reminders.
- **Insight:** 48-h metabolite & recovery chart; hangover severity forecast.
- **Accountability:** Group Mode dashboards and next-day summaries.
- **Early-warning:** dependence risk engine nudges professional help.

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5. Core Functional Pillars

5.1 Ultra-Low-Friction Drink Logging

- "Party Palette" of 3 favourite drinks, big emoji buttons.
- Press-hold slider records fractional sips (0–100 %).

5.2 Live BAC & Metabolite Engine

- Modified Widmark formula:\ `BAC = (A·5.14) / (W·r) − β·t`
- User-specific **β (elimination rate)** learned from breathalyzer deltas.
- Second-order curve for **acetaldehyde**, decaying \~50 %/3 h.

5.3 Harm-Reduction Nudges

- Colour bands (green < 0.03 %, amber < 0.06 %, red $\geq$ 0.08 %).
- "Drive-safe ETA" countdown & ride-share deep links.
- Hydration and snack prompts when steep BAC slope detected.

5.4 Dependence-Risk Detection

- 60-day rule-engine combining drink totals, binge frequency, morning >0.02 % BAC, AUDIT score, HRV suppression.
- Escalation banner → local helplines & clinic finder.

5.5 Group (Party-Table) Mode

- Tablet hub or web kiosk; QR join.
- Anonymised colour bars show each guest's BAC trajectory.
- Group cues: "Order rides for 4 in 18 min," snack suggestions, group limit pledge.

5.6 Gamified Cognitive Checks

- 30-60 s tests: Reaction Tap, Stroop Swipe, Finger-Tapping Burst, Tilt-Maze Balance.
- Drop >10 % from baseline + 30 min silence → "Did you forget to log?" prompt.

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6. Technical Architecture

6.1 Mobile / Web App Layers

- **Frontend:** React Native or Flutter; offline-first PWA fallback.
- **State:** Redux / Riverpod; local SQLite / Realm.

6.2 Data Model & Storage

- On-device encrypted vault.
- Optional end-to-end-encrypted cloud backup.

• Export to Apple/Google HealthKit.

6.3 Sensor Integrations

• **BLE Breathalyzers:** BACtrack C-series, Floome.
• **Wearables:** HR/HRV from Apple Watch, Garmin, Whoop; gyroscope & EDA for tremor/sweat.
• **Future:** transdermal TAC wearables (Skyn) & hydration patches.

6.4 Privacy & On-Device Processing

• All analytics—including dependence scoring—operate locally.
• No personal data leaves device without explicit opt-in.

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7. Algorithms & Analytics

7.1 Widmark Adaptation & β-Learning

• **Initial defaults:** $\beta = 0.015\,\%/h$; `r = 0.68` ♂ / `0.55` ♀.
• **Kalman-filter update** after each breathalyzer sync.

7.2 Multi-Day Metabolite Curve

• Ethanol → acetaldehyde (peak lag 0.5 h) → acetate.
• Area-under-curve drives hangover severity index (0-10).

7.3 Dependence Scoring Rules

```
if weekly_drinks > guideline_×1.5 for 4/6 weeks
   + binge_nights ≥3/30d
   + AUDIT ≥15
   + HRV_drop ≥10 % for ≥5 consecutive nights
then escalate()
```

7.4 ML Calibration Loop

• Nightly on-device model retrains personalised impairment threshold using game scores + confirmed BAC.

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8. Behavioral Science Foundations

• **Social proof & peer accountability** lower risky drinking among young adults.
• **Choice architecture:** pre-commitment caps, snacks/hydration suggestions.
• **Gamification:** streaks, badges, hydration points.

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9. Regulatory & Ethical Considerations

- **Informational tool**, not a medical device—avoid diagnosing or certifying fitness to drive.
- **Disclaimers** on first run & before each drive-safe message.
- **Jurisdiction presets** for legal limits (0 .02–0 .08 %).

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10. Roadmap & Milestones

Phase	Duration	Deliverables
0 — Discovery	2 wks	Competitor audit, user interviews, spec freeze
1 — MVP	8 wks	Core logging, BAC gauge, drive-safe countdown
2 — Beta	6 wks	Group Mode, two mini-games, breathalyzer pairing
3 — Public v1	4 wks	Dependence engine, hydration coach, HealthKit export
4 — V2	3 mo	ML calibration, wearable HRV integration, metabolite charts

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11. Monetization Paths

1. **Freemium:** core free; Pro tier (US\$3–5/mo) unlocks sensors, group hosting, advanced analytics.
2. **Hardware affiliate:** commission on partnered breathalyzer sales.
3. **Corporate wellness licensing** to event venues / campus programs.

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12. Risks & Mitigations

Risk	Mitigation
Accuracy liability	Always present estimates with ±20 % margin; disclaimers; encourage confirmatory testing
Low user compliance	Sub-1 s input; gamified reminders; watch-face widgets
Privacy concerns	All processing on device; zero-knowledge backup; open-source core BAC engine
Regulatory drift	Regular legal review; avoid prescriptive medical claims

13. Conclusion & Call to Action

Sober-Body™ merges physiological modelling, sensor fusion, and behavioural nudging into a single tap-friendly companion that can scale from solo sessions to lively group events.\ We invite **feedback, data partnerships, and pilot testers** to refine the MVP and validate its real-world impact on alcohol-related harm.

Contact: **alex@yourdomain.com** (placeholder)\ GitHub (private repo link forthcoming)

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14. References & Further Reading

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6. Kalant, H. — *Pharmacology of Acetaldehyde*, Alcohol Health & Res 2001.
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