Digital Health through the Empowered Health Consumer

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Vice Chancellor IT & Data
Chief Digital Officer
UC Irvine
Digital Health

**Spaces**
- Telehealth
- Digital Care
- Digital Therapeutics
- Clinical Trials Tech
- Health IT
- Mental Health
- Wellness Tech

**Global Regional Comparison Q4’21**

- **US:** $10.8B, 303 Deals
- **Europe:** $1.1B, 135 Deals
- **Asia:** $2.8B, 171 Deals
- **Rest of World:** $0.3B, 11 Deals

**Key Figures**

- **$57.2B**
  - Global digital health funding, Record year.
  - Digital health startups pulled in a record-breaking $57.2B in funding in 2021, up 79% from 2020 totals.

- **154**
  - Mega-rounds ($100M+).
  - In 2021, the number of mega-rounds ($100M+) to digital health startups nearly doubled to 154.
  - Mega-rounds accounted for the majority (57%) of total funding in Q4’21 – the second-highest quarter ever after Q1’21 (61%).

- **$37.9B**
  - US funding, The highest on record.
  - The US digital health market continues to dominate, reaching a record $37.9B in 2021. US funding hit $10.8B in Q4’21 alone – more than the second-largest global market, Asia, recorded in all of 2021 ($10.7B).

- **3X**
  - Median late-stage deal valuation increases.
  - Late-stage digital health startups are closing much larger deals at much higher valuations.
  - The median late-stage deal size increased 87% from 2020 levels to $73M in 2021. At the same time, median late-stage deal valuation jumped to $1.5B, nearly 3x 2020 levels.

- **15 mos.**
  - Median time between Series C and D raises shrinks.
  - Digital health startups are taking less time than ever to progress from mid- to late-stage financing. Moving from Series C to D, which took 22 months in 2017, has taken only 15 months (at the median) in 2021. Companies at later stages are progressing even more rapidly.
CHRONIC DISEASES IN AMERICA

6 IN 10
Adults in the US have a chronic disease

4 IN 10
Adults in the US have two or more

THE LEADING CAUSES OF DEATH AND DISABILITY
and Leading Drivers of the Nation’s $3.5 Trillion in Annual Health Care Costs

- Heart Disease
- Cancer
- Chronic Lung Disease
- Stroke
- Alzheimer’s Disease
- Diabetes
- Chronic Kidney Disease
Lifespan vs. Healthspan

Life Expectancy: 73.2 years
Health-Adjusted Life Expectancy: 64.0 years
Healthspan-Lifespan Gap: 9.2 years

Consumer wants to be healthy
We are hacking human existence

“Personalized”

“Precision”
Hacking human existence & data explosion

Data deepens the phenotypic, genotypic, multi-omic, molecular, behavioral & environmental understanding
Medication Strategies for T2D Patients

1,640 Unique Medication Trajectories for Treating T2D

UCSF Butte Lab, Dr. Atul Butte & Tom Peterson (2018)
Type-2 Diabetes is not one disease
Type-2 Diabetes is not one disease.
Can’t we do better?

“Precision”

“Personalized”

“Can I be empowered”
Can’t we do better?

1 gallon of gasoline = 31,338 calories

The average American driver uses 3.6 gallons of gas per day, roughly 500 gallons per year.

3 gallons of gas = 31,338 calories

A car burns 1.325 calories per minute at 60 MPH.

A car burns 1.325 calories per minute at 3 MPH.

The average person produces 23 pounds of CO₂ a day.

A person burns 4.6 calories per minute at 3 MPH.

Average daily calories intake for adults = 2,000

2,000 calories = 85% of one gallon of gas

Foods we get our fuel from

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories</th>
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<tbody>
<tr>
<td>Big Mac</td>
<td>450</td>
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<tr>
<td>Starbucks Grande Latte with 2% milk (16 oz)</td>
<td>360</td>
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<tr>
<td>Carrie of Coke (12 oz)</td>
<td>250</td>
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<tr>
<td>Pint of Guinesses</td>
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<tr>
<td>Tropicana Pure Premium Orange Juice (16 oz)</td>
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<tr>
<td>An Entire Outback BBQ Beefin' Onion</td>
<td>2,200</td>
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<tr>
<td>A Pot of Sen &amp; Jerry's Cheesy Monkey</td>
<td>1,800</td>
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<tr>
<td>8-oz Hot egg</td>
<td>120</td>
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<tr>
<td>Medium banana</td>
<td>200</td>
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Progression to Precision
36.5% American adults are obesity
32.5 American adults are overweight
Progression to Precision

BMI Chart

<table>
<thead>
<tr>
<th>WEIGHT lbs</th>
<th>100</th>
<th>105</th>
<th>110</th>
<th>115</th>
<th>120</th>
<th>125</th>
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BMI: 25.07

Predicted BMI

Actual: Height: 176.20 cm, Weight: 75.34 kg, BMI: 25.07

Predicted Height: 69.29 inches

Predicted Weight: 166.11 lbs

Predicted Eye Color

Predicted Skin Color

BMI Chart: Underweight, Healthy, Overweight, Obese, Extremely obese.

Actual: Height: 176.20 cm, Weight: 75.34 kg, BMI: 25.07
Digital Health through the Empowered Health Consumer

Consumer wants to be healthy
Q: What will I die from?
Q: How will I lose your healthspan?
Q: How can data be a game changer?
Phenotype & Genotype

Family History

Vericose Veins
Sleep & Exercise

Sleep Efficiency vs. Activity Calories

No correlation
Correlation (r): 0.07

Sleep Efficiency

Activity Calories

89%
80%
70%
60%
100%
1,400 Cal
1,200 Cal
1,000 Cal
800 Cal
549 Cal
400 Cal
200 Cal
0 Cal
Food-Nutrition & Metabolic Health

Continuous Glucose Monitoring

Loma Linda, Chipotle Bowl, with Black Beans
2 x 1/2 pouch

Calories Summary

- Calories: 260 kcal
- Fat (0%) - 0.0g
- Net Carbs (72%) - 36.0g
- Protein (28%) - 18.0g

Macronutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount</th>
<th>% Contribution</th>
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</thead>
<tbody>
<tr>
<td>Energy</td>
<td>260.0 kcal / 1606.0 kcal</td>
<td>16%</td>
</tr>
<tr>
<td>Protein</td>
<td>18.6 g / 56.0 g</td>
<td>32%</td>
</tr>
<tr>
<td>Net Carbs</td>
<td>36.9 g / 130.0 g</td>
<td>28%</td>
</tr>
<tr>
<td>Fat</td>
<td>0.0 g / 65.0 g</td>
<td>0%</td>
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Highlighted Targets

- Fiber: 33%
- Vitamin C: 0%
- Iron: 50%
- Vitamin B12: 0%
- Calcium: 7%
- Folate: 0%
- Vitamin A: 0%

Sep 10, 2022

Calories Consumed (kcal)

- Calories Burned (kcal)

- BMR: 1780 kcal (69%)
- Exercise: 0 kcal (0%)
- Imported Activity: 514 kcal (31%)
-Activity Level: 0 kcal (0%)
The Empowered Health Consumer

~100 daily data points (today)

Baseline Data  Episodic Data

Event Streams

Event Mining

Machine Learning

Visualization

Analysis

Personalized Models & Recommendations

Context
Empowered Health Consumer

Patient Needs
New Medication
Empowered Health Consumer