

# AI and Deep Learning in Population Health

## New Tools and Challenges

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# Disclosures and Disclaimers

## AVIA – EIR & Executive Sponsor, Medicaid Transformation Project

- AVIA is a network of 44 health systems collaborating on innovation [www.avia.health](http://www.avia.health)

## Boards and advisory roles relevant to this presentation

- Former: Aetna, Inc – health insurer, board member
- Multiple advisory board memberships with companies developing digital services
  - Conflict disclosed: member, advisory boards of [98point6](#) and [ConsejoSano](#)

No financial relationships with any other products, services, companies described here.

**This presentation uses examples of early stage AI-driven services that represent some of the most disruptive changes ahead.**

Their inclusion here is intended to be illustrative only. Their trajectories and early estimates of impact are worth understanding. Identities of companies are deleted per CME requirements.

# The Fourth Industrial Revolution –

## *What Will AI Do in Front-Line Population Health?*

- Analytics: identify clinical risk, SDOH; assign and test interventions for rising risk and near term high cost populations
- **Triage**: assign site of care; apply diagnostic capabilities
- **Diagnosis and treatment selection in primary care**: drive diagnoses in primary care, community specialty care, and treatment plans
  - Selection of therapy is increasingly built into diagnoses, with iterative testing of interventions
- Referral: direct referrals; avoid in-person visits; prevent leakage; build high value networks
- **Chronic care**: manage care for ~ 80-90% of patients; address home & community risks (SDOH), modify behavior

# Focus Today: AI In Front-Line Clinical Care



## PHARMA, BIOTECH, MEDICAL SPECIALTIES

- Drug Discovery
- Clinical Trials
- Oncology Treatment
- Hospital Operations
- Radiology / Pathology / Dermatology / Cardiology (EKG)



## CLINICAL EXTENDER

- **Virtual triage** for symptom checking, triage
- **Extends population covered**, lowers capital requirements
- **Expands clinician panels** – estimates from current ~2000 to 20,000+



## ANALYTICS

- **Predictive analytics** identifies near-term high cost individuals, complex care management needs, rising risk populations
- **Iterative, rapid cycle testing of clinical interventions** – population “precision medicine”



## CARE MANAGEMENT

- **Triage**
- **Diagnosis**
- **Treatment selection**
- **Chronic care management**



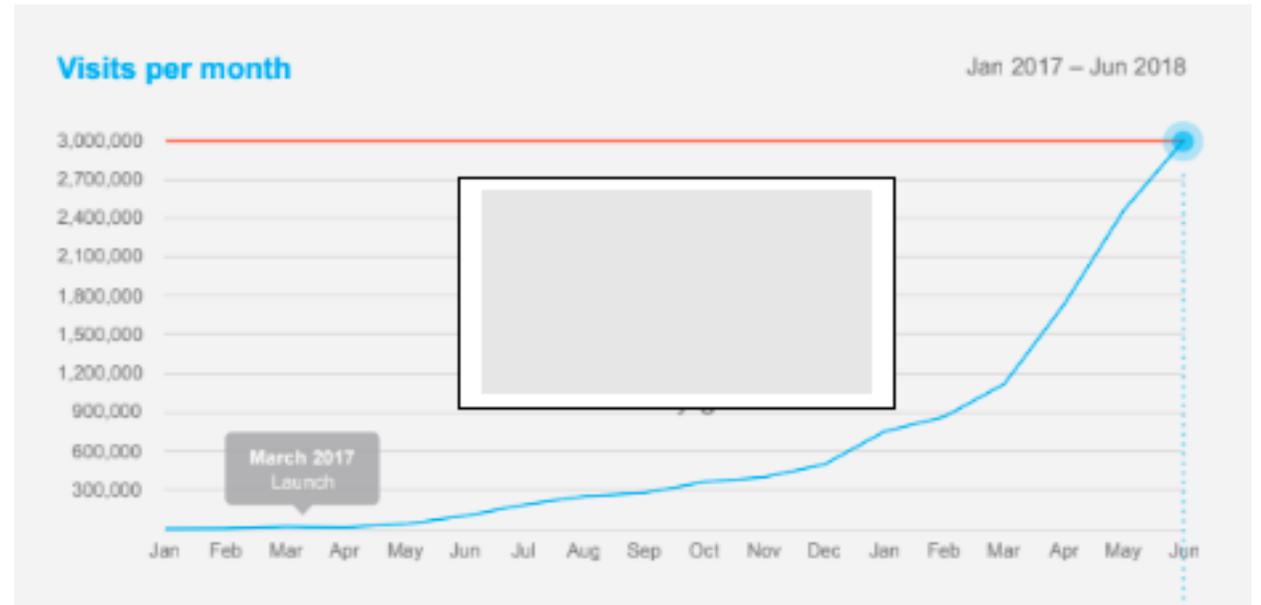
## OPTIMIZE REVENUES, WORK PROCESSES

- **RAF Scores**
- **Optimize specialist referrals**
- **Empower speech recognition, combine with NLP for transformed EHR processes**

**SOCIAL DETERMINANTS  
OF HEALTH**

# Virtual Triage Today

- Multiple entrants
- Unique presence of multiple international offerings developed and validated in Europe
- Evolution from triage to full diagnosis + treatment + management, particularly in international offerings
- US-based entrant from AMC:
  - Growth from market entry to 40 million users in 15 months
  - Achieved 3M visits per month in 15 months, vs 10 years for best known doc-finder application, and 7 years for Netflix



# Chatbots Are Familiar To Consumers

Messenger 

Search Messenger

**Message Requests**  
Facebook User and 1 more

9:38pm

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sent an attachment.

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GYANT  

9:38PM

Get Started

Hello Molly, my name is GYANT, your personal health care companion.

My job is to help you identify any medical symptoms you might have and keep you healthy!

So, you're a robot?

Yeah, I am a robot. A very sophisticated, charming and handsome robot, but a robot nonetheless. 😊

Alright, here's how it works: I'll ask you some simple yes-no and multiple choice questions.

Then, I'll consult my database 🔍 and provide you with relevant information about possible causes and what to do next.

Of course, whatever you tell me will stay strictly between us! 🤐

All clear?

Yes, let's go!

Options

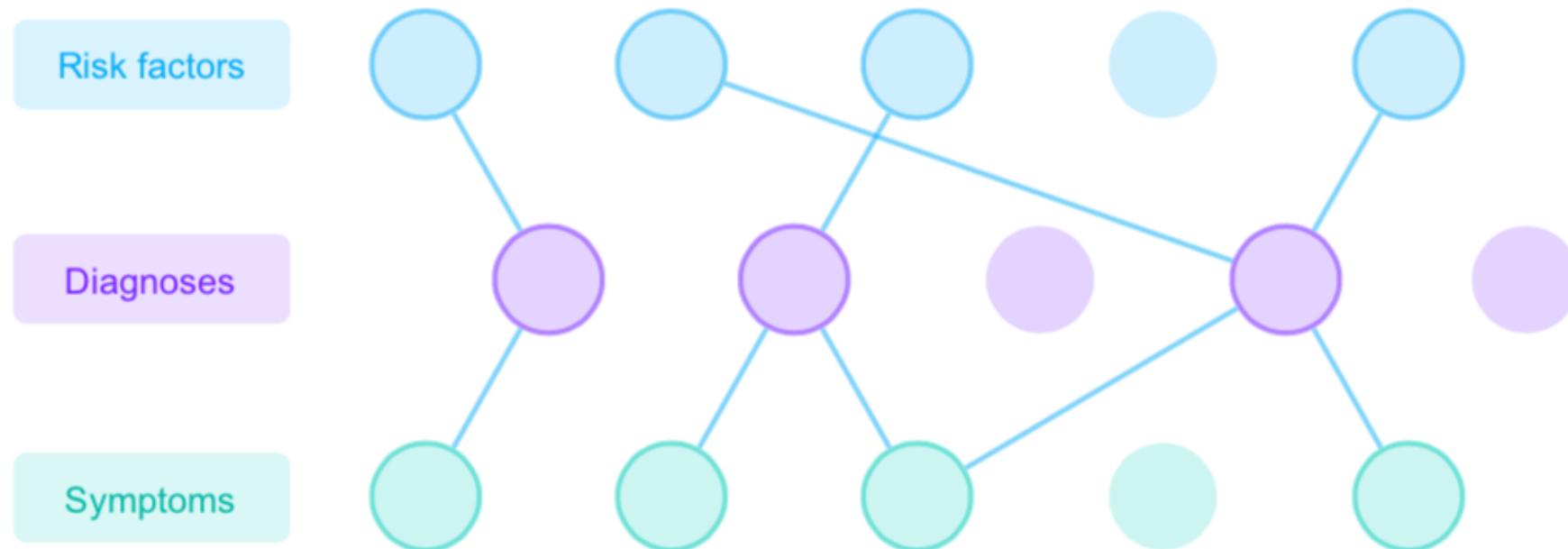
- Search in Conversation
- Manage Messages
- Rate Experience
- Notifications

Messenger Link

[m.me/theGYANT](https://m.me/theGYANT)

# Triage Will Become Diagnosis

uses a probabilistic expert system to analyze symptoms, risk factors, and diagnoses in real time.



We read +22,000 clinical papers covering 5M patients and +2,000 diagnoses to build this graph.

We've had to develop powerful automation and insight tools to enable extreme efficiency and accuracy.

# Clinical Validation

## Urgent Care

- Patients used the waiting room.
- Patients are seen by their physician
- We compare the doctor's note and EITput.

**500**  
Urgent Care Patients

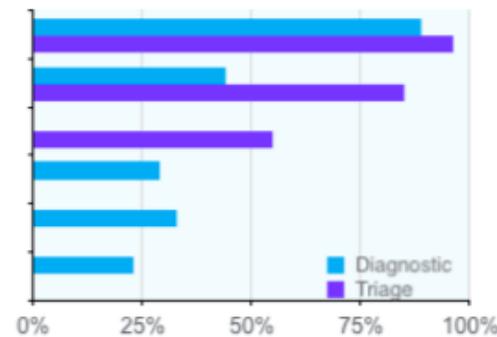
**90%**  
Diagnostic Accuracy\*

**92%**  
Triage Accuracy\*

## Chest Pain

- 100 standardized cases written by clinicians, focusing on chest pain
- Cases vary in severity and incidence
- Cases through versus competitors

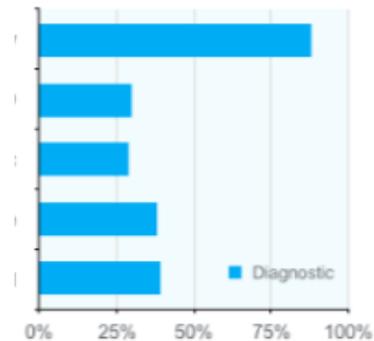
Diagnostic & Triage Accuracy



## Headache

- 100 standardized cases written by clinicians, focusing on headache
- Cases vary in severity and incidence
- Cases through versus competitors

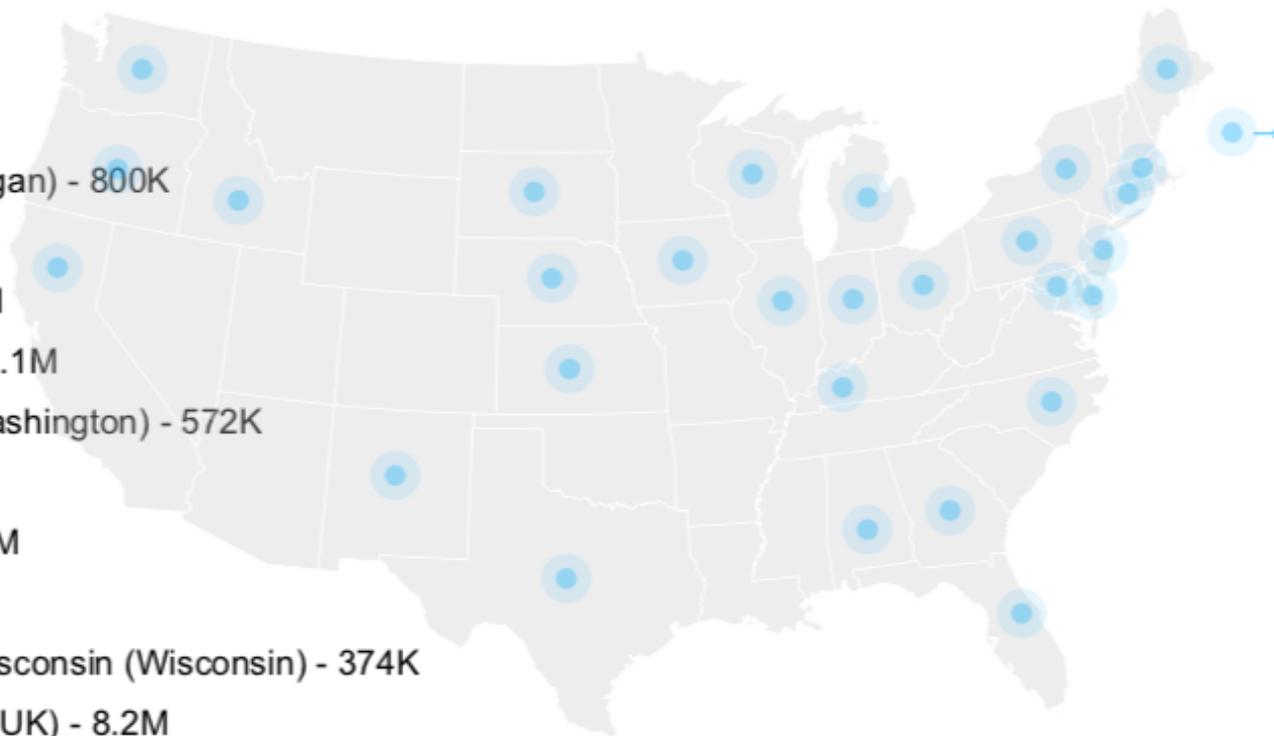
Diagnostic & Triage Accuracy



# X has significant volumes in your areas

FOR AVIA Showcase 2018

- Health First (Florida) - 1.8M
- Henry Ford Health System (Michigan) - 800K
- MD Anderson (Texas) - 2.7M
- Memorial Hermann (Texas) - 2.7M
- Mercy Health (Ohio, Kentucky) - 1.1M
- Providence St. Joseph Health (Washington) - 572K
- OSF Healthcare (Illinois) - 1.22M
- Trinity Health (20+ states) - 16.95M
- BayCare (Florida) - 1.8M
- Froedtert & Medical College of Wisconsin (Wisconsin) - 374K
- Imperial College Health Partners (UK) - 8.2M
- Presbyterian (New Mexico) - 91K
- St. Luke's University Health Network (Pennsylvania) - 1.1M
- University of Kansas Health System (Kansas) - 196K



# CVS Chatbot Uses AI To Connect Patients To The Right Treatment



The chain pharmacy's MinuteClinic is integrating services from [Health](#) to offer more efficient, on-demand patient care, providing customers at-home assistance by way of an AI assistant.

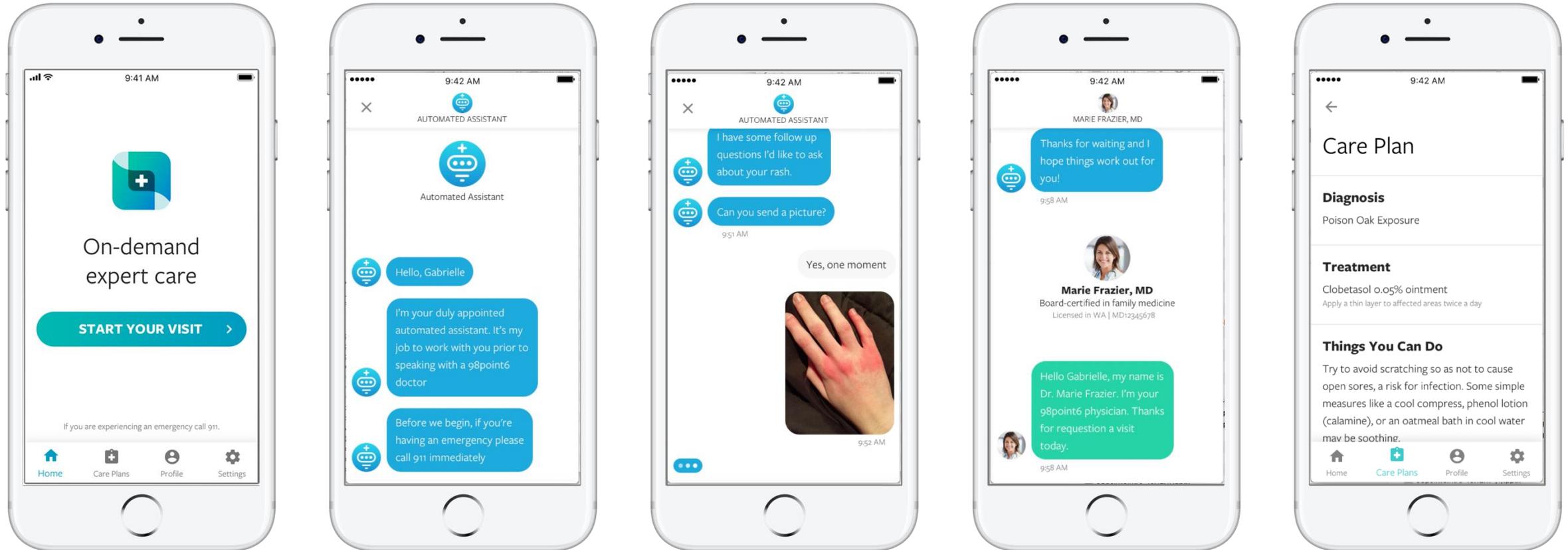
[Health](#) is an online symptom and cure checker that uses an intelligent algorithm backed by **medical** data to diagnose patients.

PRESS RELEASE, 16 JULY 2018

[CVS Health's MinuteClinic](#) is taking steps to give patients a fuller healthcare experience thanks to its partnership with [Health](#). The latter is a tech company that specializes in the development of tools to help people get the care they need from the moment of diagnosis, and will now be integrated in to MinuteClinic's over 1,000 locations.

With the use of [Health](#)'s AI in conjunction with a brick-and-mortar establishment, patients will have better access to affordable and accurate care. By simply logging on to [www.cvsminuteclinic.com](#), patients will be run through a series of questions and then put in contact with a local MinuteClinic if on-site treatment is required.

# Completely Virtual Primary Care



Service extends beyond episodic care, including answering medical questions, diagnosis and treatment, prescriptions, labs, referrals, follow-up, reminders and more. Available on iOS, Android and web platforms.

# Early Learnings, Leading Indicators

## System Design

- Available today in 43 states + D.C., accessible to 95% of U.S. adult pop (238M)
- Salaried physician team including stock options & licensed in all 50 states
- On track to have 100,000 members under contract by end of year

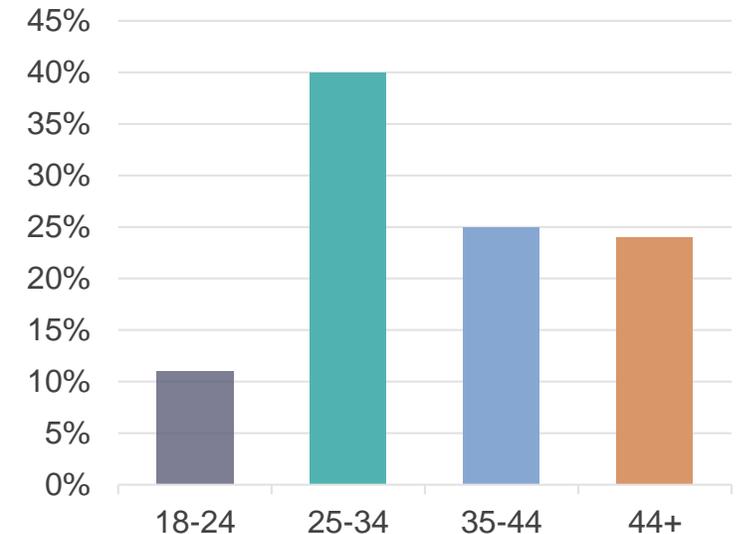
## Resolution Rate, Patient Acceptance

- Over 200 different conditions treated per month
- **95% of conditions/questions resolved without need for in-person care**
- Over 25% of visits are returning users with a new condition or question
- Average patient wait time of less than 30 seconds
- Over 30% of visits are requested from non-traditional settings (coffee shop, airport, during commute, from work, etc.)
- Net Promoter Score higher than Apple and Netflix, Kaiser, health plans, and current primary care

## Affordable Cost

- Employers: \$1 PEPM
- **Global access: unlimited primary care at US\$10 per year through foundations**

## Early Use By Demographics



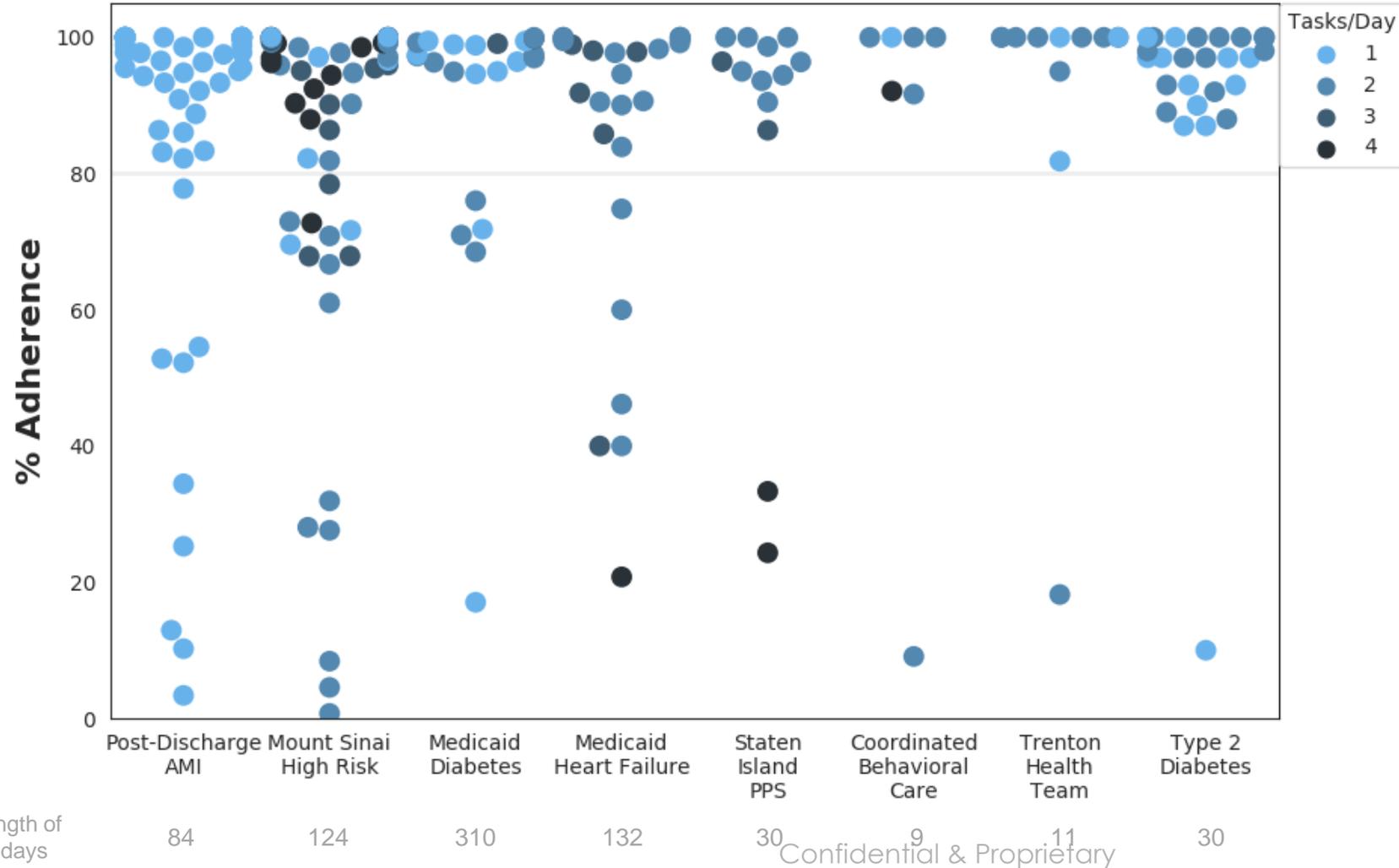
Female



Male

# Chronic Care Management – Behavioral Economics

One product is producing 89% average care plan adherence, even in high-risk Medicare/Medicaid populations



89%

Average Daily Adherence

86%

Of Users ≥80% Adherent

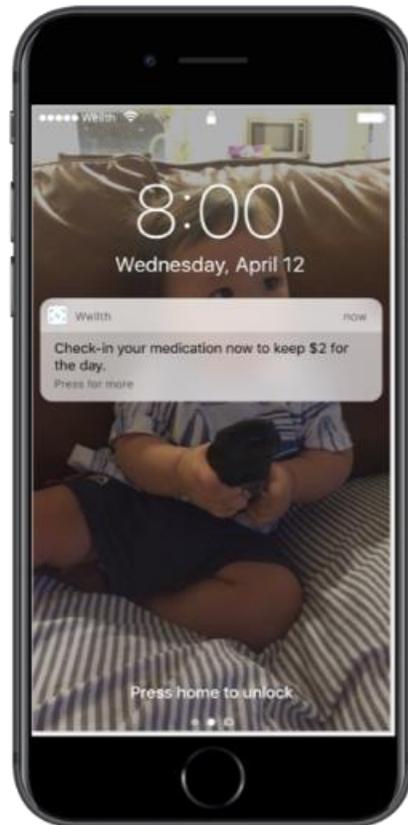
Average length of program in days

Confidential & Proprietary

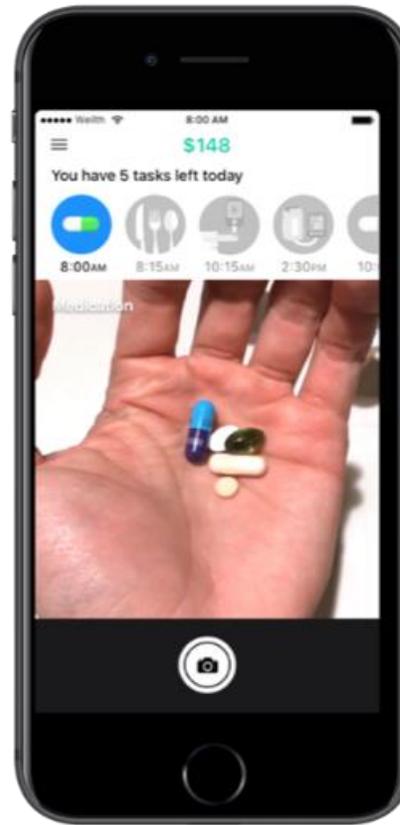
# How do I get lasting behavior change?

Habits are formed through a series of repeated triggers, behaviors, and rewards. On average, it takes 66 days of repetition to form a habit.<sup>1</sup>

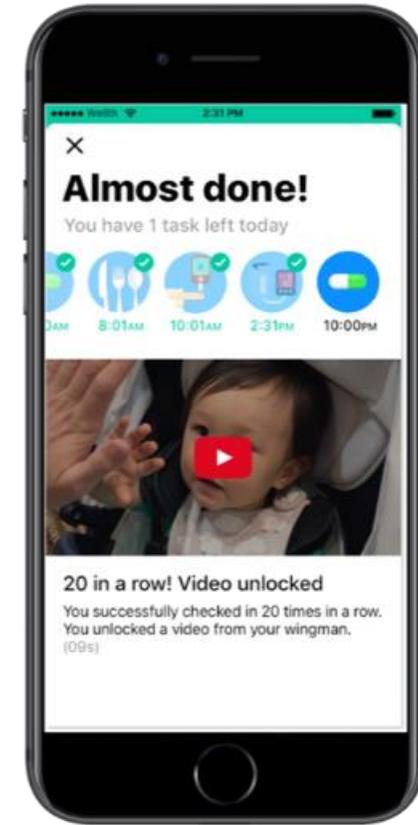
## Trigger



## Behavior

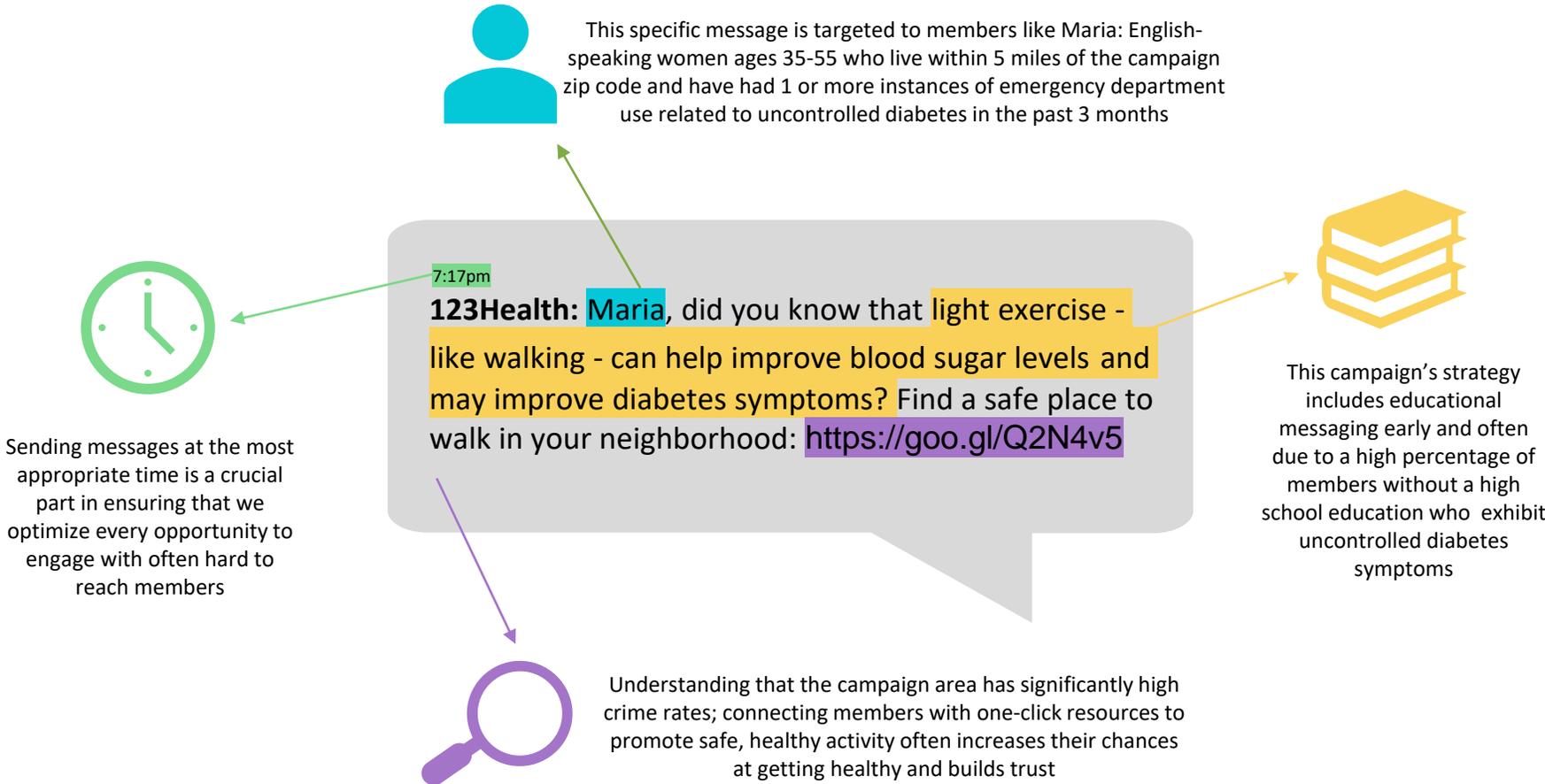


## Reward

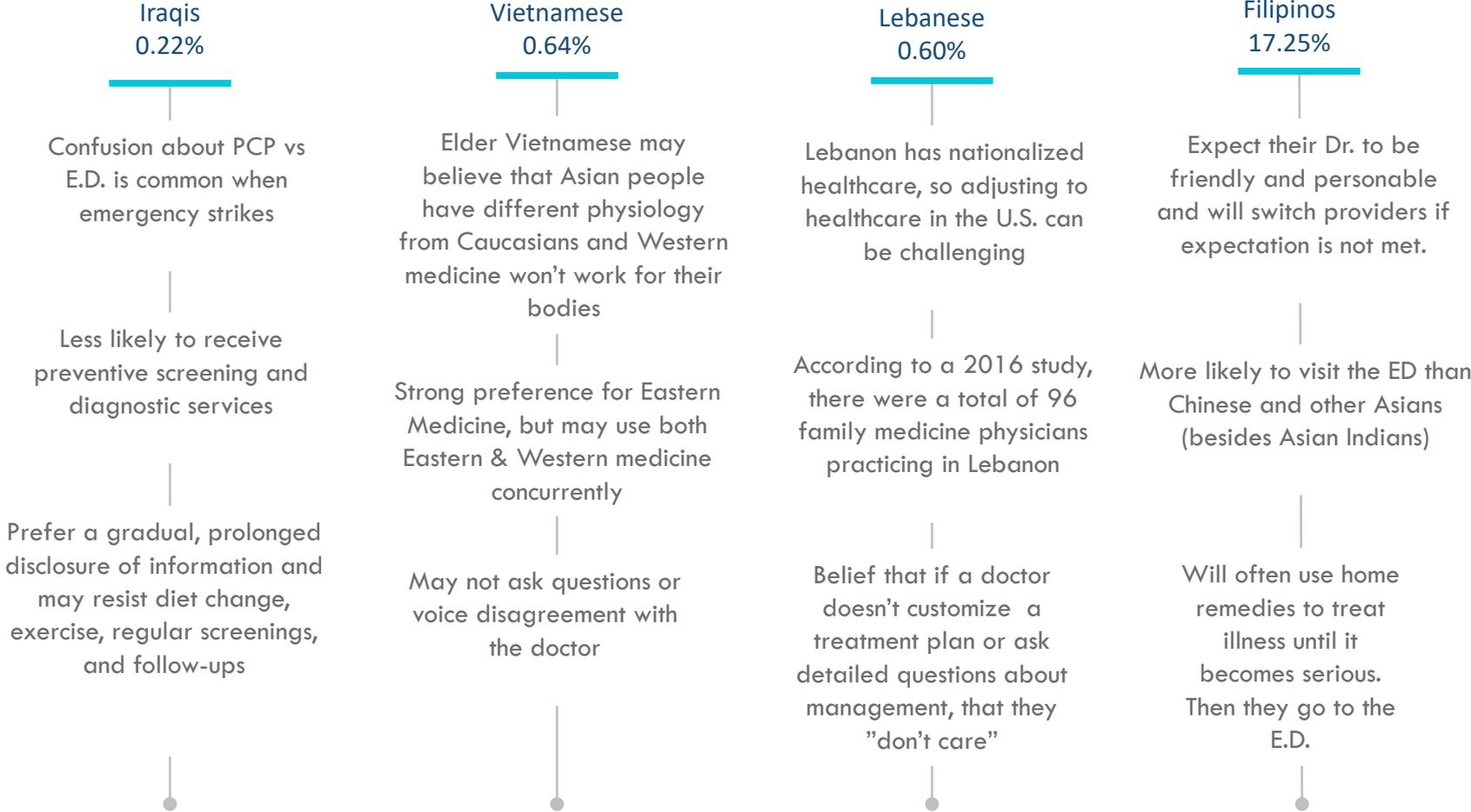


# Chronic Care Management - Culturally Effective

**The Anatomy of a Message: Multicultural populations benefit when engaged on the basis of how they live their lives and the factors that impact their daily choices.**



# Cultural Detailing – Understanding E.D. Utilization Trends by Culture



# Chronic Care Management – Metrics for Success

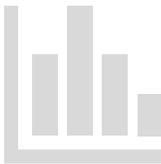
For members that participated in our multi-level, culturally-sensitive engagement campaigns, the results are outstanding.

Success Rate:  
**Appointment  
Activations**



**85%**

Success Rate:  
**Gaps in  
Care Addressed**



**59%**

Success Rate:  
**Return on  
Investment**



**7:1**



**September 2018**  
UCLA Medical Center research study confirms impact  
with first FQHC client.

# Implications for Clinical Care and Stakeholders

- Five years from now, **market traction** is likely to confirm the consumer preference and clinical resource efficiency of similar applications of AI.
- These implications – from the examples presented and from other emerging solutions – suggest these effects, at a minimum:
  - Rapid and **extensive leveraging of clinicians**, resulting in far fewer clinician resources needed per population covered
  - Clinician roles evolve to consultation on population management, resolution of complex cases, and **increasingly limited direct patient care engagement**
  - **Struggles in adapting to these new modalities** for individual clinicians, professional associations, delivery systems, even health plans; policymakers beginning to develop first-generation solutions, e.g. FDA