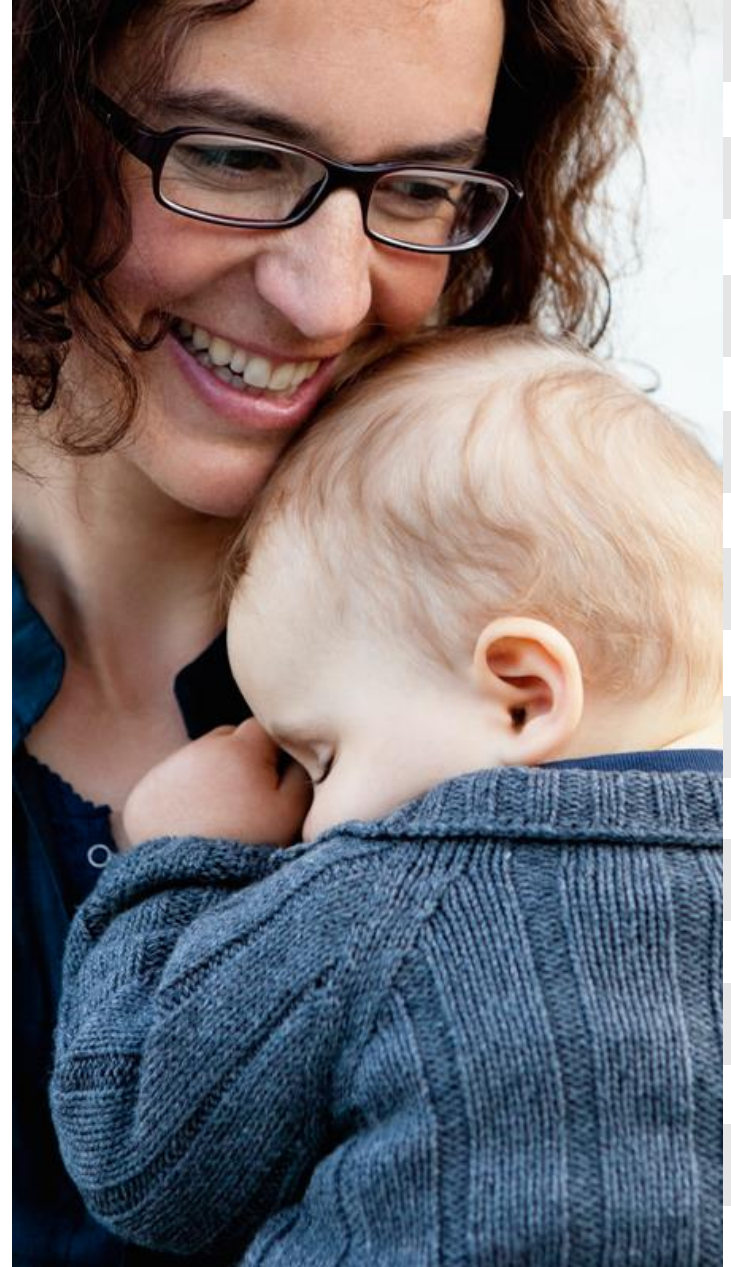


# Glucose Management through Digital Health Solutions

**Korey K. Hood, Ph.D.**  
Professor and Staff Psychologist,  
Stanford University School of Medicine



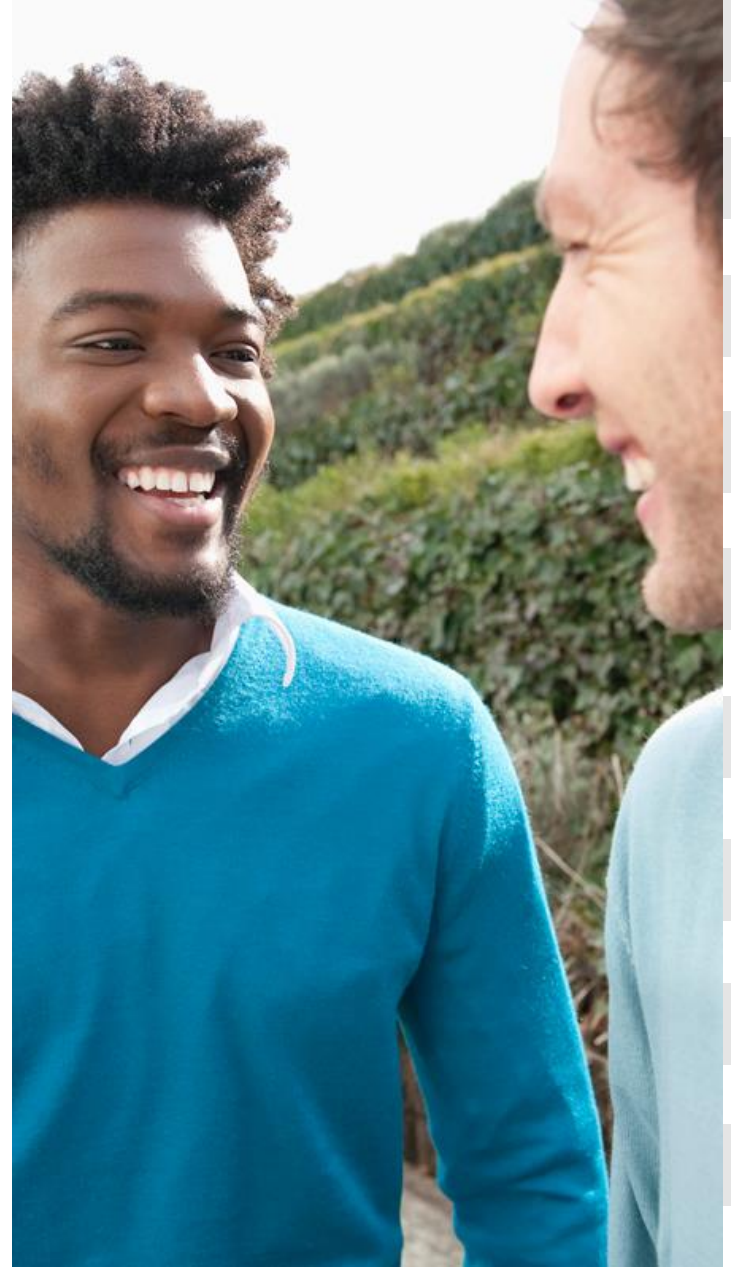
# Take-home Points

1. Diabetes management is complex and demanding
2. Diabetes devices and technologies can reduce burden of management and improve clinical outcomes
3. Efforts to prevent and reduce diabetes distress and burnout will improve uptake and optimal use of devices



# Diabetes Management

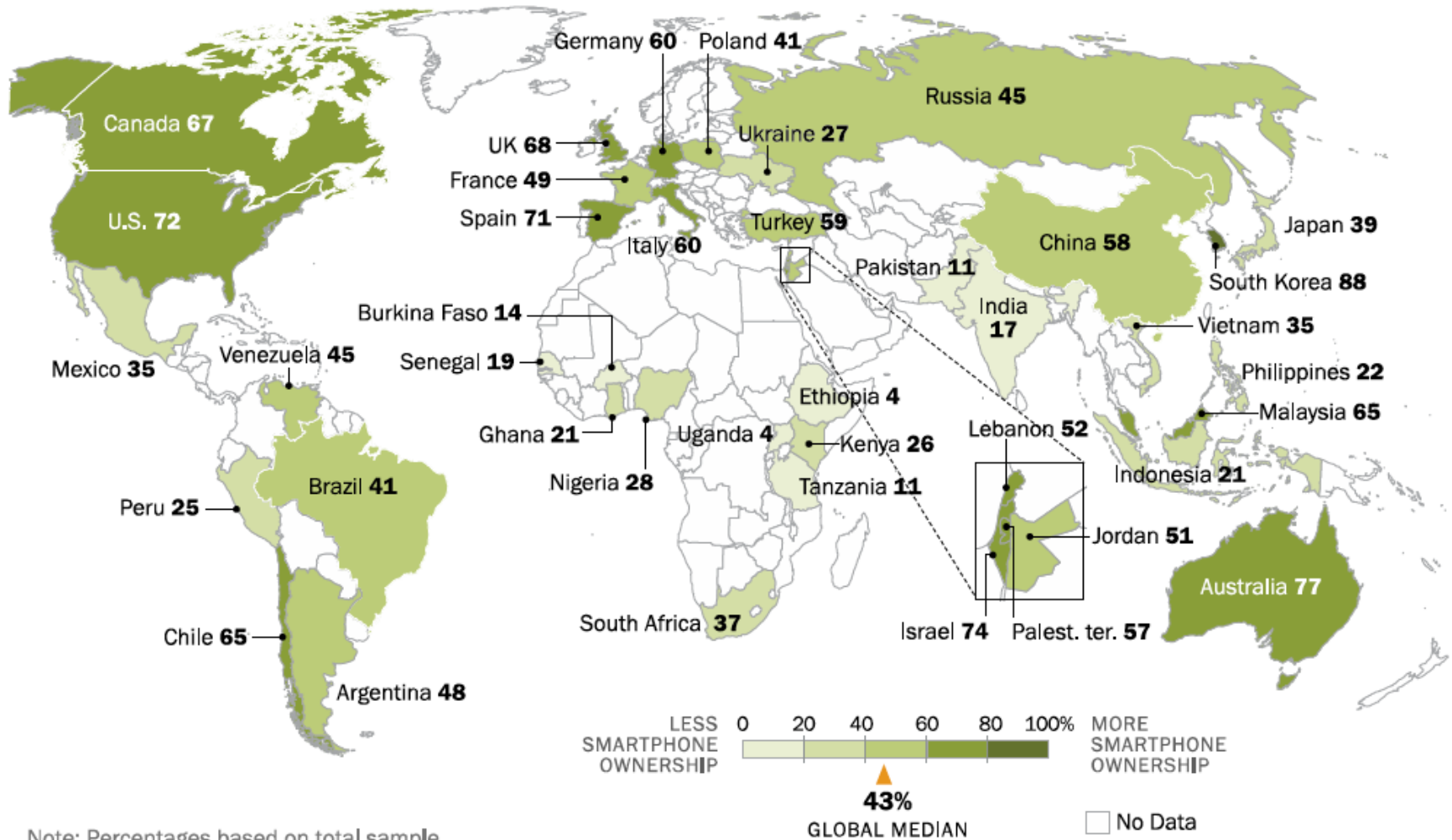
- Daily monitoring of blood glucose
- Medication taking, often including insulin
- Counting carbohydrates and understanding dietary content of foods
- Engaging in physical activity and understanding how that affects glucose
- Consider all of these tasks together and multiple times daily



# Landscape of Device and Technology Use

# Smartphones are more common in Europe, U.S., less so in developing countries

Percent of adults who report owning a smartphone



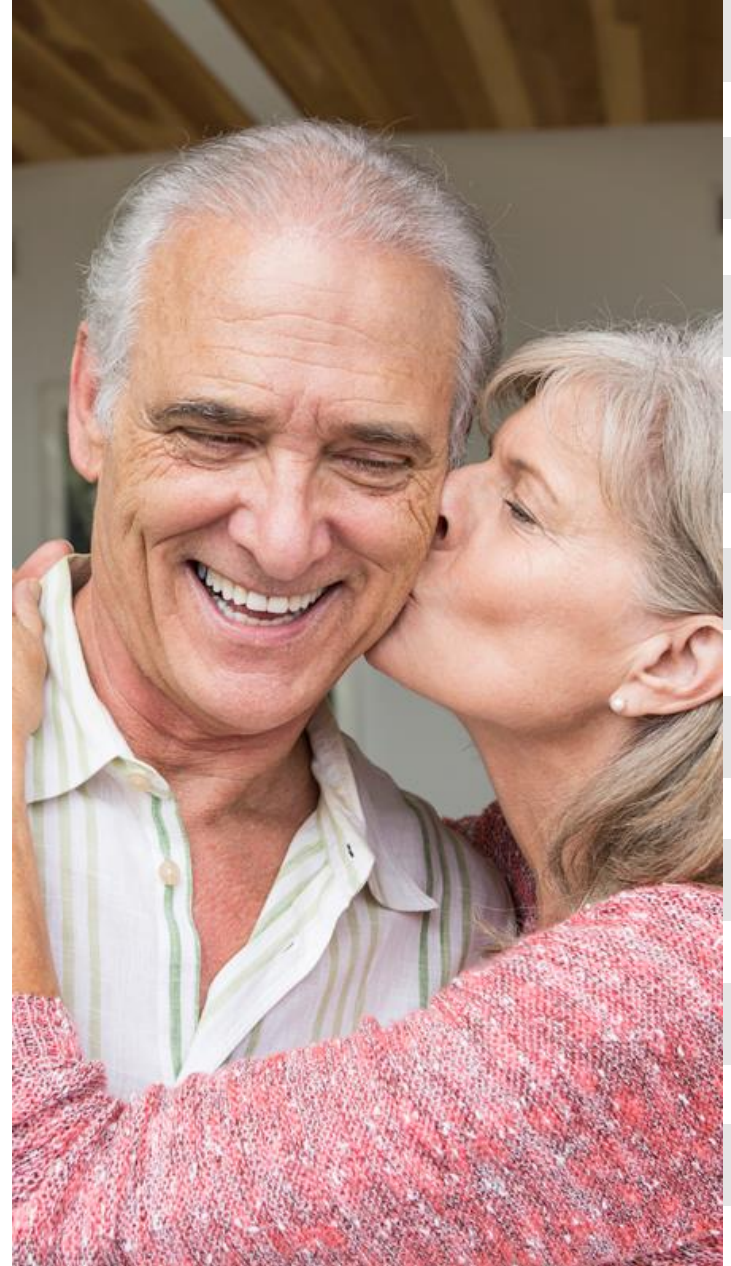
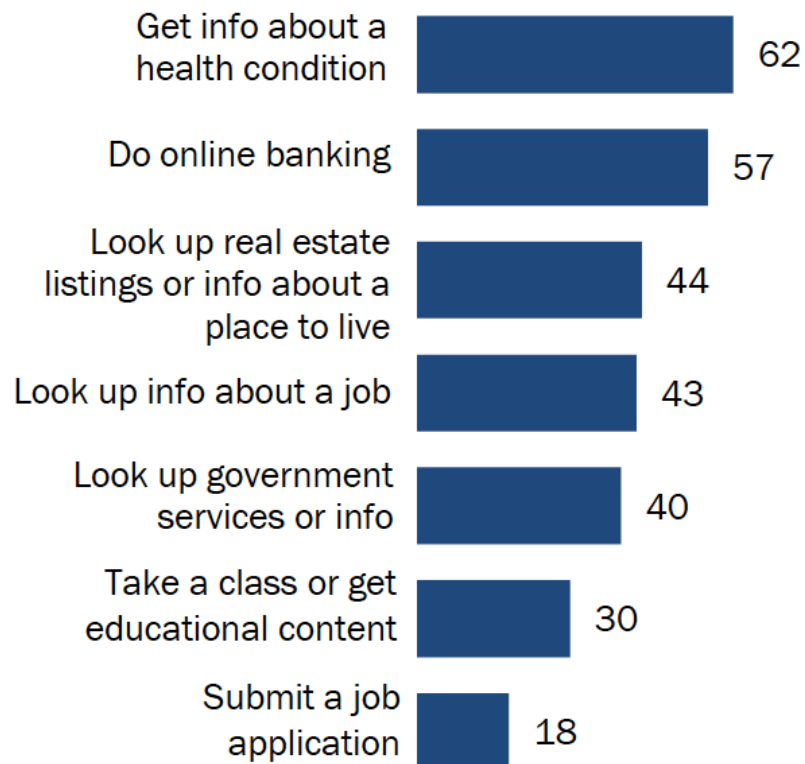
Note: Percentages based on total sample.

Source: Spring 2015 Global Attitudes survey. Q71 & Q72.

PEW RESEARCH CENTER

## More than Half of Smartphone Owners Have Used Their Phone to get Health Information, do Online Banking

*% of smartphone owners who have used their phone to do the following in the last year*



# Polling Question

What percentage of U.S. adults track a health indicator like weight, diet, or a symptom?

- A) 28%
- B) 42%
- C) 69%
- D) 81%

JANUARY 28, 2013

# Tracking for Health

69% of U.S. adults track a health indicator like weight, diet, exercise routine, or symptom. Of those, half track “in their heads,” one-third keep notes on paper, and one in five use technology to keep tabs on their health status.

<http://pewinternet.org/Reports/2013/Tracking-for-Health.aspx>





1

**Seven In ten** U.S. adults keep track of a health indicator.



2

**60%** of U.S. adults say they track their weight, diet, or exercise routine.



3

**One-third** of U.S. adults track health indicators such as blood pressure, blood sugar, headaches, or sleep patterns.



4

Half (**49%**) of those who track health indicators do so 'in their head'.

<http://pewinternet.org/Reports/2013/Tracking-for-Health.aspx>

# Types of Technology

# Diabetes Devices and Technologies



- Blood glucose meters
- Insulin delivery devices – insulin pumps and pens
- Continuous glucose monitoring (CGM) devices
- Mobile apps as trackers
- Upload data to central site
- Trend programs within apps or devices

# Polling Question

Which type of technology is focused on synthesizing data and offering information on trends?

- A) Direct
- B) Direct+
- C) Facilitators

# Direct Technology

- Data support the use of pumps, meters, trackers to optimize *direct* management and control
- Some support for quality of life benefit



# *Direct+ Technology*

- *Direct* programs plus layer of data synthesis or trend analysis
- Examples are CGM systems and trend programs



# *Direct+* Technology

- Automate pattern management
- Empower self-management
- Reduce burden
- Improve glycemic control



# Facilitators Technology

**Novel ways to engage and motivate**

*and*

**Facilitate easier diabetes  
management**

*and, potentially*

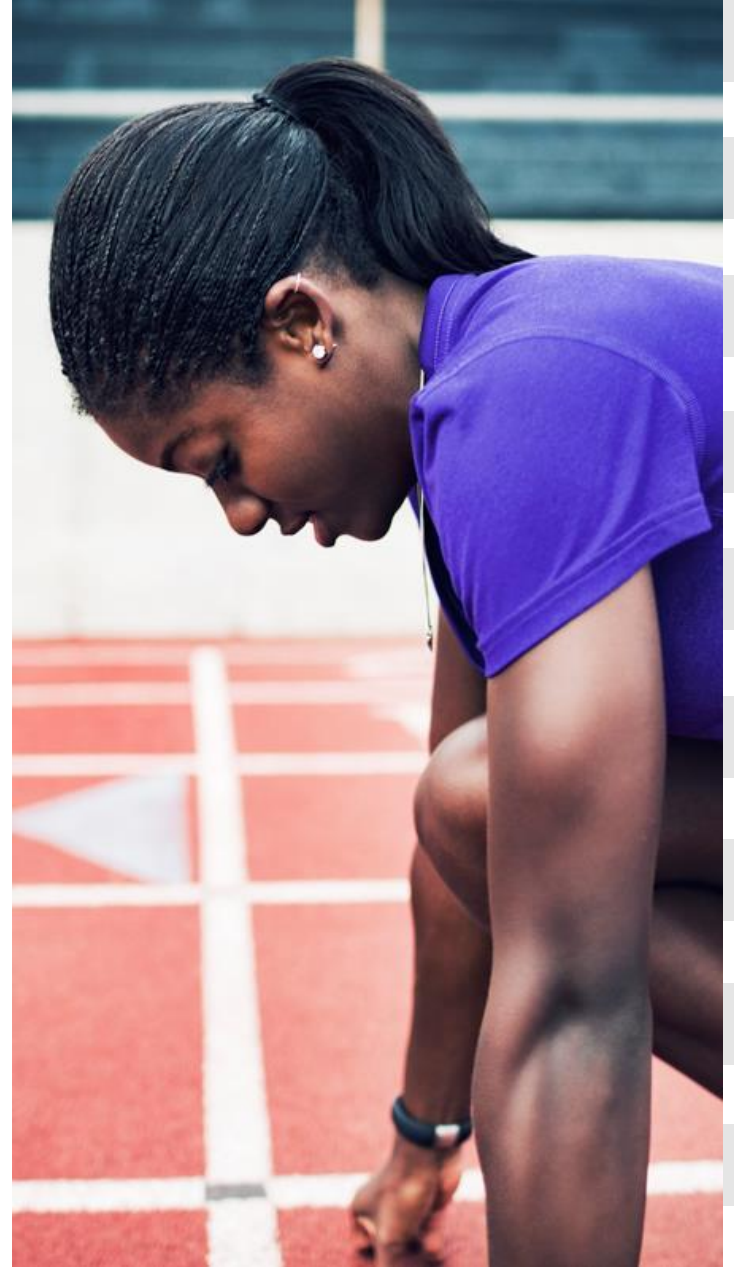
**Improve health outcomes**





# mHealth - What is Known?

- mHealth is being used clinically in diabetes care
- Several states have tele-health laws requiring 3rd party payers to reimburse for tele-health
- Strong empirical support for behavioral health delivered via technology
- Most mHealth research in diabetes done with adults



# Practical Strategies

# Case Example - Martin



- Martin is 47 years old, African-American, married, and has had type 2 diabetes for 2 years
- Martin is on metformin and a GLP-1 receptor agonist
- Martin is taking metformin twice daily and a daily GLP-1 receptor agonist
- Martin misses 1-2 doses per week of each med
- Martin tends to “overeat” and gets little exercise

# In your visit, you need to ...

- Assess diabetes self-management and make realistic, achievable goals for Martin
- Determine if changes need to be made to Martin's medication doses or if new medications need to be added
- Find some way to “empower” or “motivate” Martin to take better care of his diabetes



## Strategies

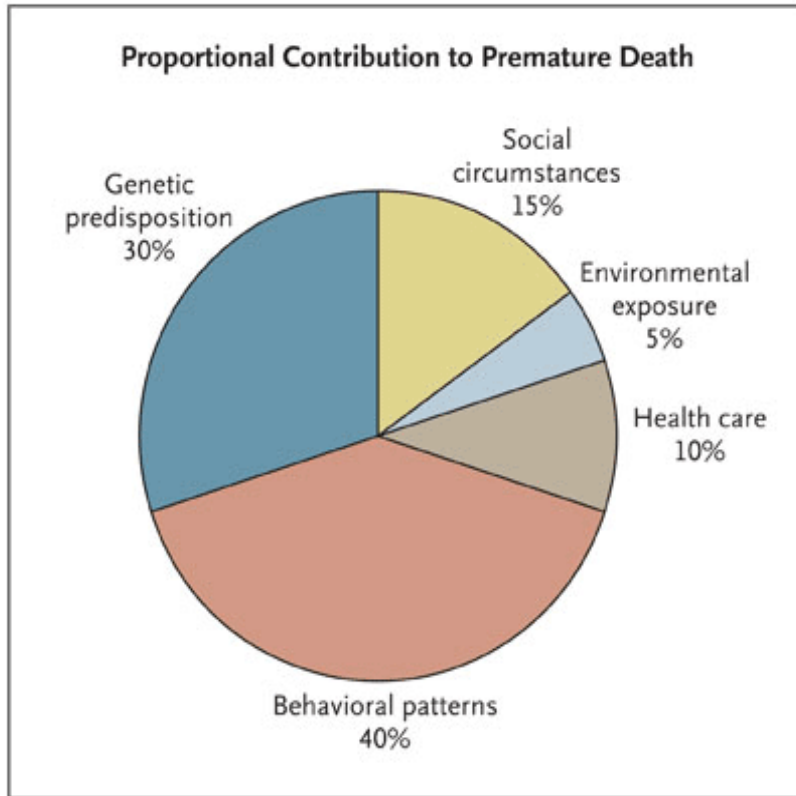
- Focus on behavioral patterns
- Matter-of-fact approaches with validation of emotions
- Teach problem solving
- Encourage digital health

# Polling Question

Which of the following is the largest contributor to premature death?

- A) Social circumstances
- B) Genetic predisposition
- C) Environmental exposure
- D) Behavioral patterns

# Behaviors



- If the goal is to improve health, targeting health care will not be enough
- We should focus on changing behavioral patterns

Schroeder, NEJM, 2007; Figure adapted from McGinnis et al, Health Aff, 2002

# Matter-of-fact style

Principle and applications supported by decades of research with people with diabetes

## Strategies specific to diabetes:

- Think of blood sugars as information
- Do not react (as hard as it sounds)
- Increase likelihood diabetes tasks will happen again by positive reinforcement
- Don't be afraid to ignore





# Operant Conditioning

The frequency and strength of a behavior is going to be increased or decreased depending on the consequence

- Antecedents to the Behavior are contextual factors and situations that cue behaviors
- The Consequence is either reinforcement or punishment
- **A-B-C** model of human behavior



# Contingencies

**Rare** for people to do something because “it is good for them.” Especially if they do not like that thing ...

# Contingencies

Help develop a scaffolding to internalize the importance

Apps and diabetes devices can be used in this way  
(reminders, rewards, unlocking game levels, positive affirmations)

# Problem Solving in Diabetes Self-Management and Control

A SYSTEMATIC REVIEW OF THE LITERATURE

is defined as “a learned behavior that includes generating a set of potential strategies for problem resolution, selecting the most appropriate strategy, applying the strategy, and evaluating the effectiveness of the strategy”

Hill-Briggs & Gemmel. Problem solving in diabetes self-management and control.  
Diabetes Educator 2007:Nov-Dec;33(6):1032-50; discussion 1051-2.

# Results of Review

- Associations with self-management and control
- Interventions have largest impact on self-management and psychosocial outcomes
  - Less so on glycemic control



Hill-Briggs & Gemmel. Problem solving in diabetes self-management and control. Diabetes Educator 2007:Nov-Dec;33(6):1032-50; discussion 1051-2.




# It all starts with a GOAL


Goals should be **SMART**:

- **Specific**
- **Measurable**
- **Attainable**
- **Realistic**
- **Time-bound**


# OneTouch Reveal<sup>®</sup> mobile app

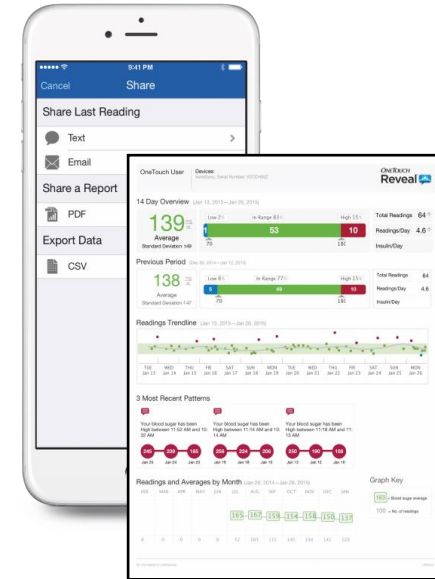
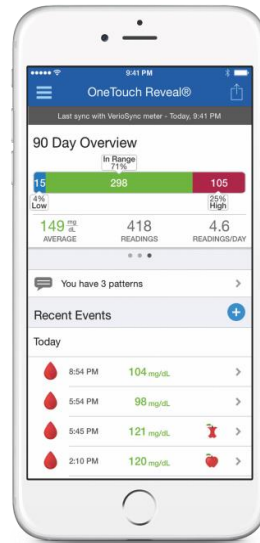
## In the moment & on the go

 **Integrated readings across multiple devices**

 **Simple, colorful visuals**

 **Electronic logbook**

 **See and share progress**



The Bluetooth<sup>®</sup> word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by LifeScan Scotland Ltd. is under license. Other trademarks and trade names are those of their respective owners.

iPhone and iPad are registered trademarks of Apple Inc.

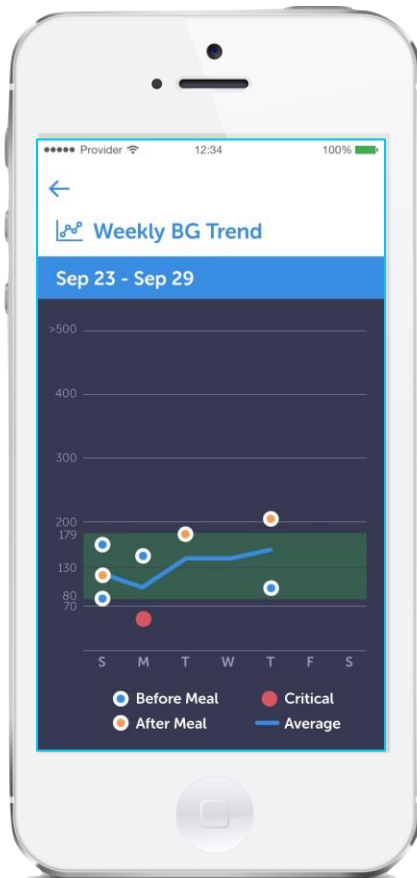
# The OneTouch Verio Flex<sup>®</sup> meter & BlueStar<sup>®</sup> app offer a powerful solution to help patients achieve their diabetes self management goals





# How BlueStar<sup>®</sup> drives outcomes

Helps patient and provider identify blood glucose and med adherence trends



Applies algorithms driven by the treatment plan in a personalized fashion

Record Meds

Date: Today

I took all medications

**BREAKFAST MEDS** [Add](#)

Took all breakfast meds

Humalog  
With Breakfast 4 units  
4 units based on BG 280 mg/dL [Insulin calculator >](#)

Lantus 2 units

Metformin  
1,000 mg 2 tablet(s)  
[Add to medication list >](#)

**LUNCH MEDS** [Add](#)

Educates patient to understand and take control of type 2 diabetes

BlueStar

Nov 29, 9:00 AM 300 mg/dL → Nov 29, 12:00 PM 50 mg/dL

Your blood glucose recently dropped from very high to very low in a short period of time. [Read](#)

TODAY, WED, 04 NOV

[Did you take your breakfast meds?](#) [Yes](#)

[Kick back in a comfy chair... and read our collection of articles to help you to manage your diabetes your way!](#) [View](#)



Enter your blood glucose

Delivers personalized guidance to the patient when they need it most

ATTENTION - YOUR BG IS

58 mg/dL

**30 - 15 Tip**

 → 

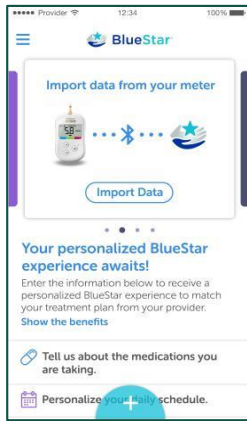
30 grams fast acting carbs      15 minutes: Recheck

Your BG is very low. A common way to treat low blood glucose is to eat 30 grams of carbs and recheck your BG in 15 minutes. If you need immediate medical attention, call 911.

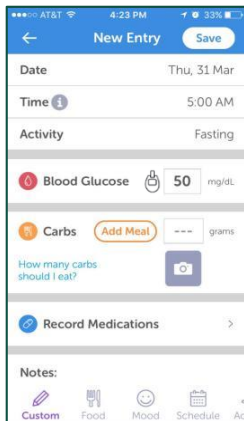
[Entered Wrong BG](#)      [Continue](#)

# BlueStar<sup>®</sup> real time feedback

## WellDocs' platform possesses the capability to deliver real-time feedback in both off and on-line modes.



Sync



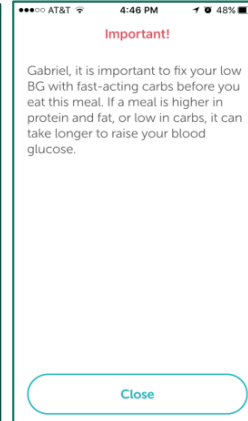
Data



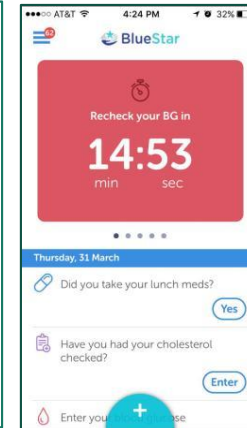
Information



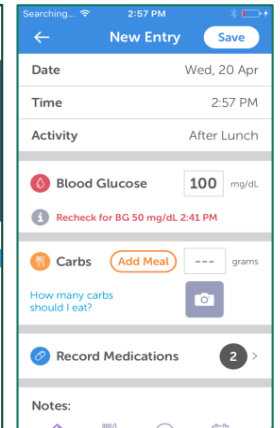
Knowledge

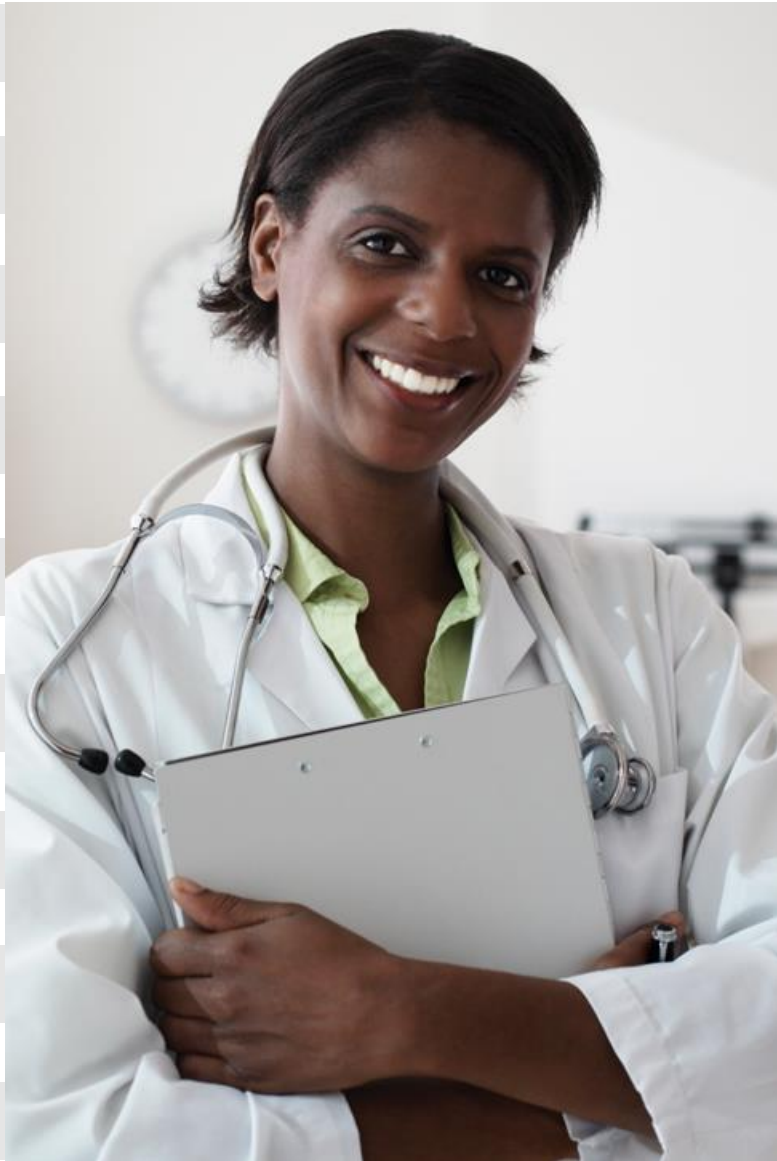


Action



Outcome





## Summary

Leveraging technology requires:

- Scaffolding and sound behavioral principles
- Direction from a health care professional (not discouragement)
- Education and support

*Johnson & Johnson* **DIABETES CARE COMPANIES**

For more information visit [www.jjdi.com](http://www.jjdi.com). **Become a member and opt in** to be notified about our new programs, publications and more!

**Follow us on Twitter** [@JJDiabetesInst](https://twitter.com/JJDiabetesInst) to receive timely and important updates about diabetes!