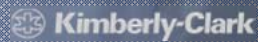




# The Science of Behavior & Infrastructure in Driving Food Safety Culture

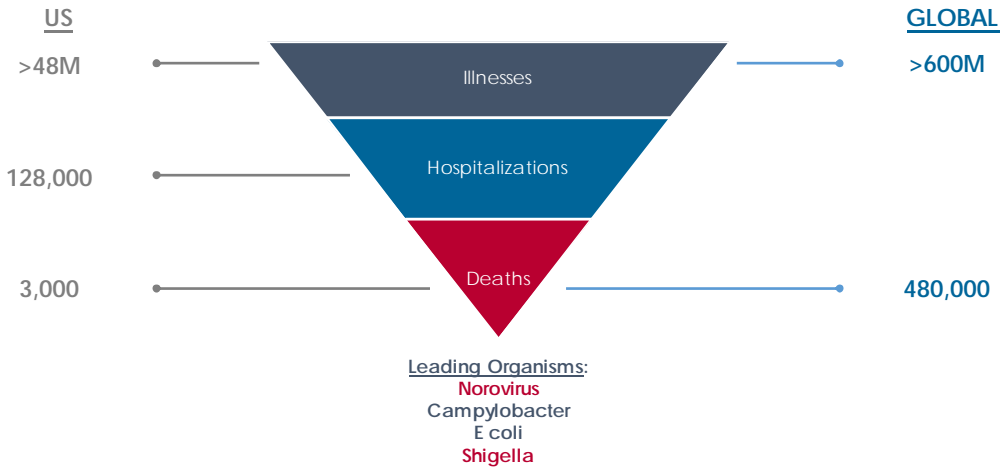
Phillip Jarpa  
Kimberly-Clark Professional  
September 23, 2016



Why is this essential?

Approximately 800 outbreak events in the US without significant change

The CDC estimates that 1 in 6 people in the US suffer a foodborne illness annually



Source: CDC, WHO

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More than **40%** of companies have experienced an event in the last 2 years...

(GeoStrategy, 2015)

Poor personal hygiene has the **Highest non-compliance rate...**

(FoodNet, 2012)

responsible for **94%** of Shigella outbreaks

(FoodNet, 2012)



## Food workers are a major source of contamination

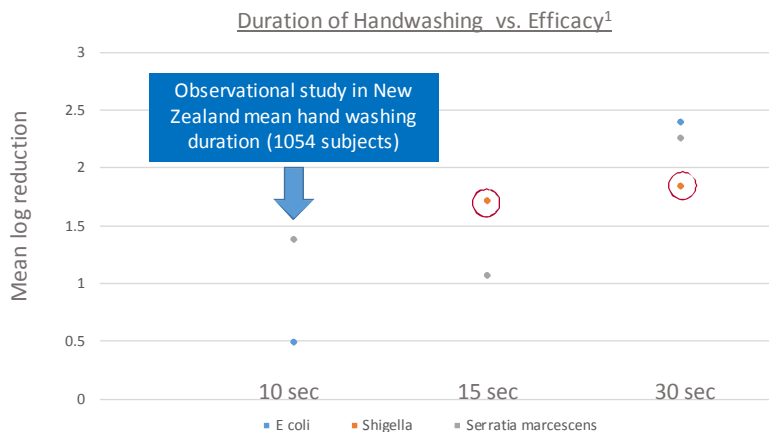
Meta-analysis of 66 outbreaks that occurred in the US between 1975 and 1998 found that **82% of the outbreaks implicated food workers as the source of contamination** and, in 50% of the cases, **hands were the source** of pathogen transmission.<sup>1</sup>

According to the CDC **~25-50%** of food workers do not wash for the recommended time<sup>2</sup>.

Source: (1)Jensen et al. "Quantifying the Effect of Hand Wash Duration, Soap Use, Ground Beef Debris and Drying Methods on the Removal of Enterobacter aerogenes on Hands." J of Food Protection, 2015. (2) CDC

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## Most people do not wash their hands correctly which creates a false sense of hygiene safety



New Zealand Ministry of Health and US FDA recommends 20 sec for hand washing

CDC and APIC recommend 15 sec hand wash

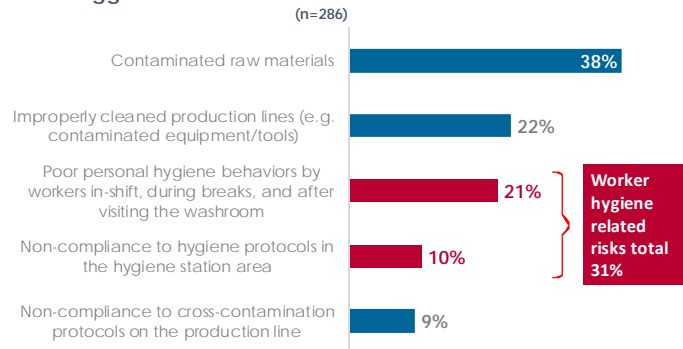
Source: (1)New Zealand Food Safety Authority, Handwashing and Drying Duration Evidence for Efficacy, March 2009.

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## Hand hygiene compliance is a real risk in food processing.

**33-73%** of food facilities are out of compliance with proper hand washing procedures<sup>2</sup>.

### Biggest concerns related to contamination risks<sup>1</sup>



Source: (1)GeoStrategy Partners Global survey of QA managers in Food Processing facilities. (Nov 2015); (2) Green, L.R. Factors Related to Food Worker Hand Hygiene Practices, Journal Food Protection, 2007.

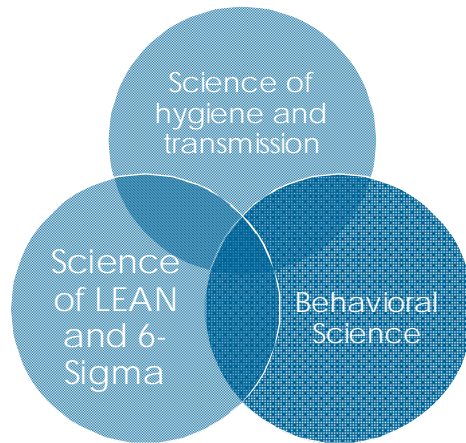
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“ If the only tool you have is a hammer, you tend to see every problem as a nail ”

Abraham Maslow  
Psychologist  
1908 - 1970

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By blending different scientific disciplines, we have identified relevant strategies to address hand hygiene compliance.



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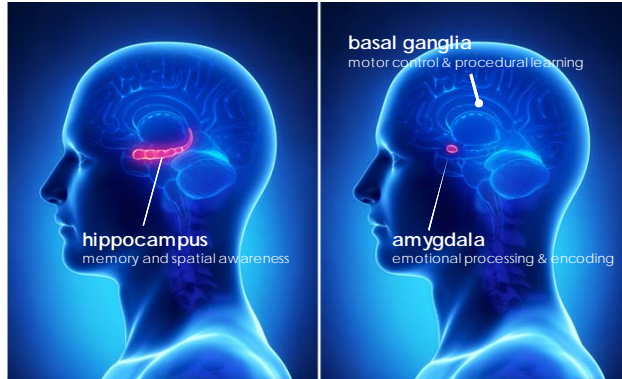
Behavioral science is an important, cost-effective tool to improve hand hygiene compliance

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This is what brain science tells us about how we think...



**Conscious** processing accounts for about 5% of actual behavior  
Thoughtful, controlled – 40 bits per second



**Subconscious** processing drives about 95% of actual behavior  
Fast, reactive, automatic – 11 million bits per second



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we  
think  
less  
than we  
we think  
we think

Daniel Kahneman  
Nobel Laureate & Psychologist





## Study 1: Guatemala Food Processing Plant

### Pre-Test Observations:

- Not enough time washing hands
- Most workers (~100) trying to get through 2 hand hygiene stations in 15 minutes = long lines and rushing steps
- Improper hand hygiene post-toileting
- Hand hygiene step perceived as "pre-work" vs. "work"

**GOAL:** Increase the compliance (time) & efficacy of hand washing & drying, thereby improving clean hands going into the factory floor

Subjects: 220 employees across 3 shifts

Test period ~1 month

Phase 1: Baseline (8 days)

Phase 2: Behavioral Science Intervention (12 days)

Phase 3: No Intervention for (7 days)

Microbial Swab Hands conducted by external micro lab: 1150

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## Study 1: Guatemala meat processing facility Hand Stamp Intervention



### DEFAULT

(We go with pre-set options)

- Introducing a stamp disrupts the default process



### PRIMING

(We are influenced by subconscious cues)

- Stamp results in **added friction & time spent washing**



### AFFECT

(Social expectation / norm with stamp appearance)

- Stamp and collateral helps create discuss and shame (if not removed)



### SALIENCE

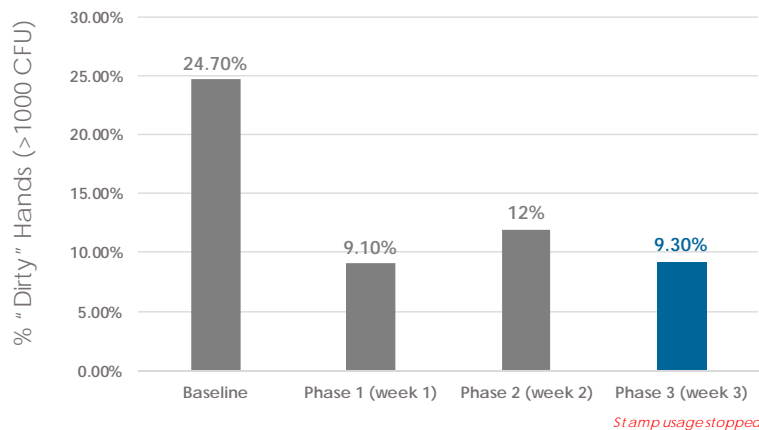
(What is visually obvious to us drives our attention)

- Stamp makes visible when hands are clean or not



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## ~63% reduction in "dirty" hands and sustained reduction after intervention ceased



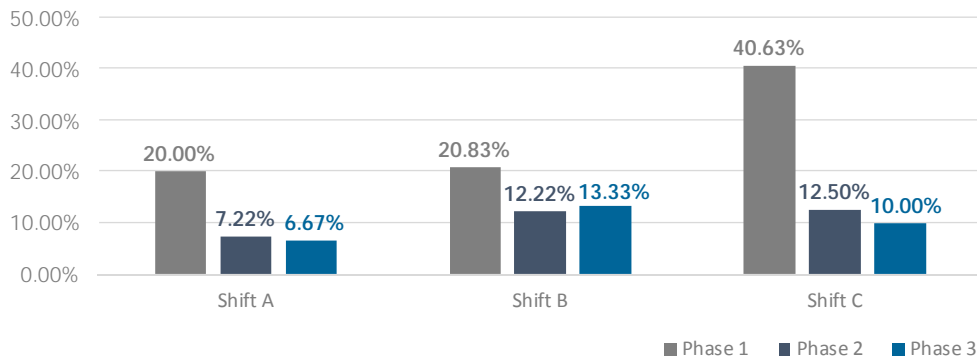
Source: Final report by OgilvyChange on Guatemala study, 2015.

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## Significant reduction in "dirty" hands with night shift and stickiness after intervention ceased

Percentage of workers in morning, afternoon and night shift returning a 'dirty hands' result (Total Plate Count exceeding 1000UPC safe limit)



Source: Final report by OgilvyChange on Guatemala study, 2015.

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## Study 2: Peru Dry Snack Food Processing Plant - Compliance Observations

### Pre-Test Observations:

- Not enough time washing hands (~5-8 sec)
- Long lines cause people to rush (non-compliant) hygiene steps (queuing psychology)
- Workers drying wet hands on uniform
- Workers bypassing long lines

**GOAL:** Increase the compliance (time) & efficacy of hand washing & drying, thereby improving clean hands going into the factory floor

Subjects: ~250 employees across 2 shifts

Test period ~1 month

Phase 1: Baseline (1 days)

Phase 2: Behavioral Science Intervention – with "expert" on site (14 days)

Phase 3: Behavioral Science Intervention – with no "expert" on site (ran by employees) (7 days)

Microbial Swab Hands conducted by external micro lab

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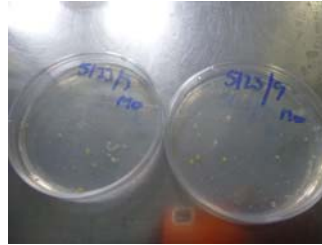
Before the results, we need to establish thresholds...

**Dirty (1000 < CFU/Hand)**



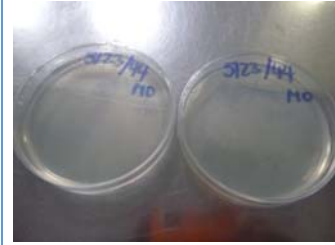
Actual count on images: 14000 and 24000 CFU/Hand

**Acceptably Clean (10 - 1000 CFU/Hand)**



Actual count on image: 460 CFU/Hand

**Very Clean (<10 CFU/Hand)**



Unacceptable, requires immediate attention\*

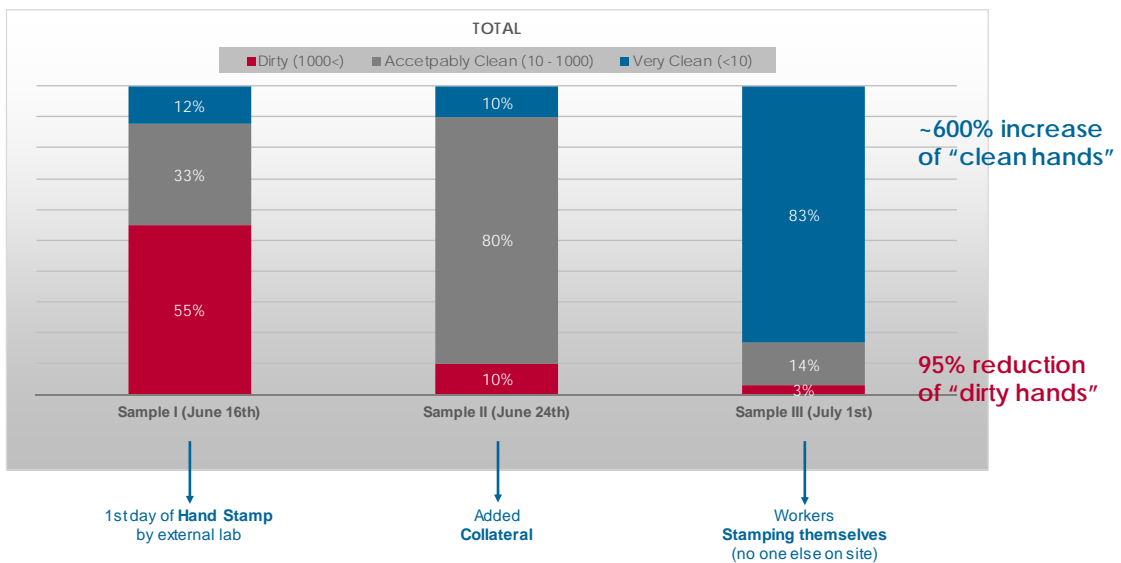


Lowest possible limit of detection

\* Source: Swift Microbiological Labs for the Food Processing Industry

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Study 2: Peru snack food processing facility (Using the hand stamp)



Source: Peru study conducted by SGS on behalf of Kimberly-Clark Corp, June 2016.

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## Drying Methods Affect Cross-Contamination Risk

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Queuing psychology teaches us that **people will not wait unless the perceived benefit > perceived cost** (social pressure of others waiting).

### **We observed...**

Long lines waiting for air dryers caused many people to “finish drying” on their uniforms or skip washing altogether

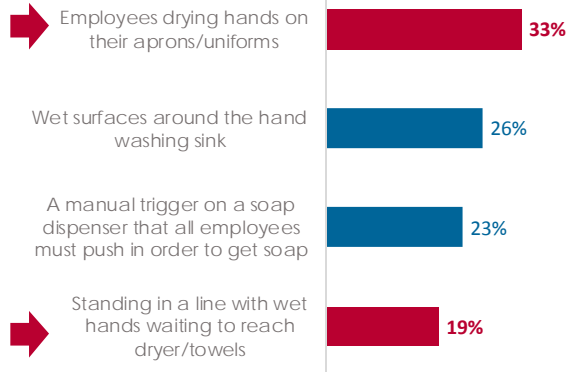
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## QA managers see several of the top contamination risks related to hand drying

*Employees [new or otherwise] overlook rules, forget things—it's just human nature. And they love to bypass the hand washing station. — QA Manager, WTI*

Percent of first place rankings (n=277)



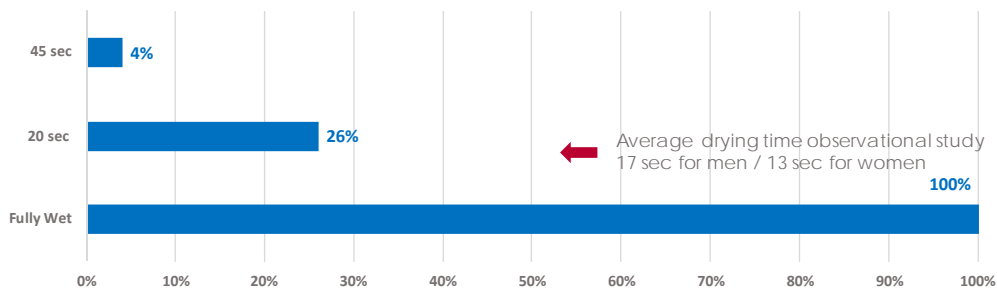
Source: (1) GeoStrategy Partners Global survey of QA managers in Food Processing facilities for Kimberly-Clark Corp (Nov 2015)

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## Bacteria are transported through moisture and the drying method is proven to impact cross-contamination.

**Wet hands** pick up and **transfer up to 1,000 times the number of bacteria** as dry hands and provide the moisture and warmth that bacteria need to grow<sup>1</sup>

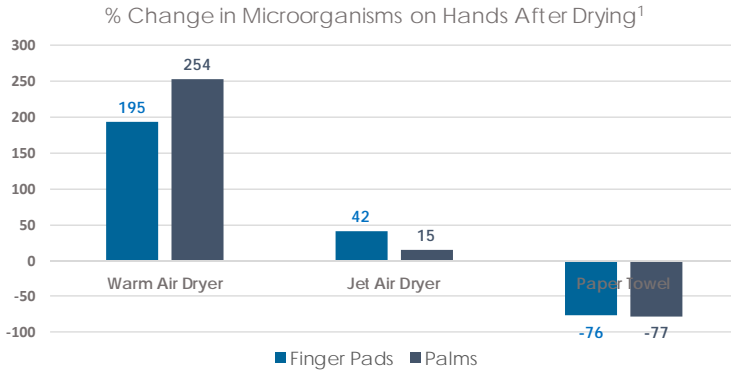
Transference of Microorganisms from Hands after Drying with Hot Air Dryer<sup>1</sup>



Source: (1) New Zealand Food Safety Authority, Handwashing and Drying Duration Evidence for Efficacy, March 2009.

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So the drying method is critical to hand hygiene. Hand towels provide FRICITIONAL REMOVAL of microorganisms while air dryers DISPERSE SHARED microorganisms onto hands.

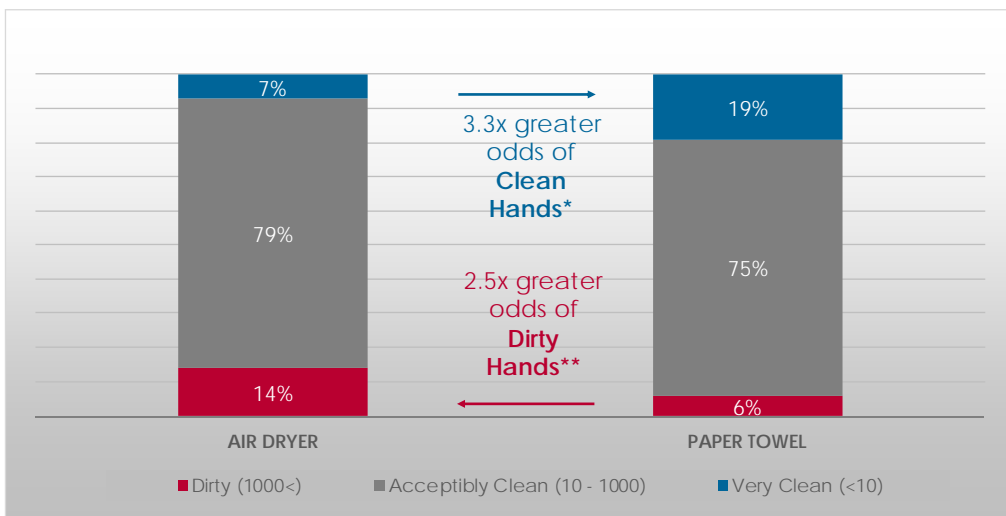


*"Paper towels appear to offer a measurably significant benefit (0.5 log CFU greater reduction) when used after hand washing. Using paper towels to dry hands resulted in 1.9 +/- 0.9 log CFU per wash reduction in E. aerogenes, which is significantly greater than air drying."<sup>2</sup>*

Source: (1) Redway et al, "A comparative study of three different hand drying methods: paper towels, warm air dryer, jet air dryer." European Tissue Symposium, 2008; (2) Jensen et al. "Quantifying the Effect of Hand Wash Duration, Soap Use, Ground Beef Debris and Drying Methods on the Removal of Enterobacter aerogenes on Hands." J of Food Protection, 2015.

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With a designated 10 sec dry, there was a 3.3X increase in clean hands with towels in our Peru in-situ study using new Jet Air Dryers.



Source: Peru study conducted by SGS on behalf of Kimberly-Clark Corp, June 2016.

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**There seems to be a relationship between the type of drying method and self-declared contamination events**

*When was the last time you had an event at the plant related to contamination or possible contamination?*

	Total (N=301)	Paper towel (N=151)	Air dryer (N=143)
Within the past year	28%	19%	38%
Within the past 2 years	43%	30%	56%
Within the past 5 years	55%	41%	71%
Never	34%	50%	15%

Source: (1)GeoStrategy Partners Global survey of QA managers in Food Processing facilities for Kimberly-Clark Corp (Nov 2015)

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## Conclusions for APEC

- Foodborne illness has a significant impact on health; and food safety incidents have significant impacts on trade and economic growth
- Proper hand hygiene is critical in preventing food safety incidents and should be an integral component of food safety system strengthening efforts
- As part of U.S. efforts to see that food safety measures are developed in a science-based manner, APEC economies should take into account lessons from behavioral science as essential to driving an improvement in hand hygiene compliance
- The 2009 WHO Guidelines on Hand Hygiene in Health Care Settings provides a good basis for hand hygiene in food safety settings
- The hand drying method has a significant impact on hygiene

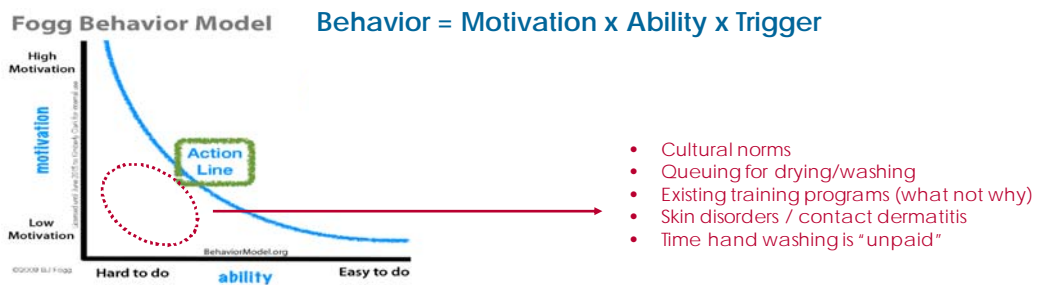
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# APPENDIX

**Approach:** Use behavioral science to drive an improvement in hand hygiene compliance

1. Trigger a New Habit by making the right thing to do the easy thing to do



Source: BJ Fogg, Stanford University.

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Approach: Use behavioral science to drive an improvement in hand hygiene compliance

2. Tap into our innate human motives driven by heuristics

- 

**REMINDERS**  
They are freely allowed by our surroundings
- 

**PRIDE**  
Our actions are influenced by how we are seen
- 

**DEFAULTS / COMMITTY**  
People tend to move in the direction of the default or what they all do
- 

**AFFILIATION**  
Personal associations, values are affected and decision making
- 

**BONUSES / COMMITMENT**  
We learn the best of our behavior and keep it
- 

**COMMITMENT**  
We tend to be consistent with our public promises
- 

**DEFAULTS**  
To provide positive spaces
- 

**EGO**  
We tend to want to feel better about ourselves
- 

**SALIENCE**  
Our attention is drawn to what is novel and unusual
- 

**REPUTATION**  
We don't like the idea of being judged

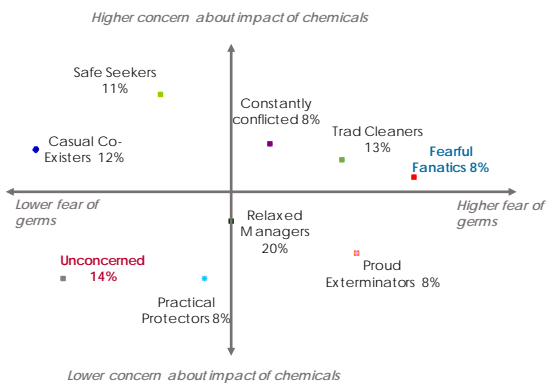
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People have different attitudes, perceptions and cultural beliefs that drive their behavior



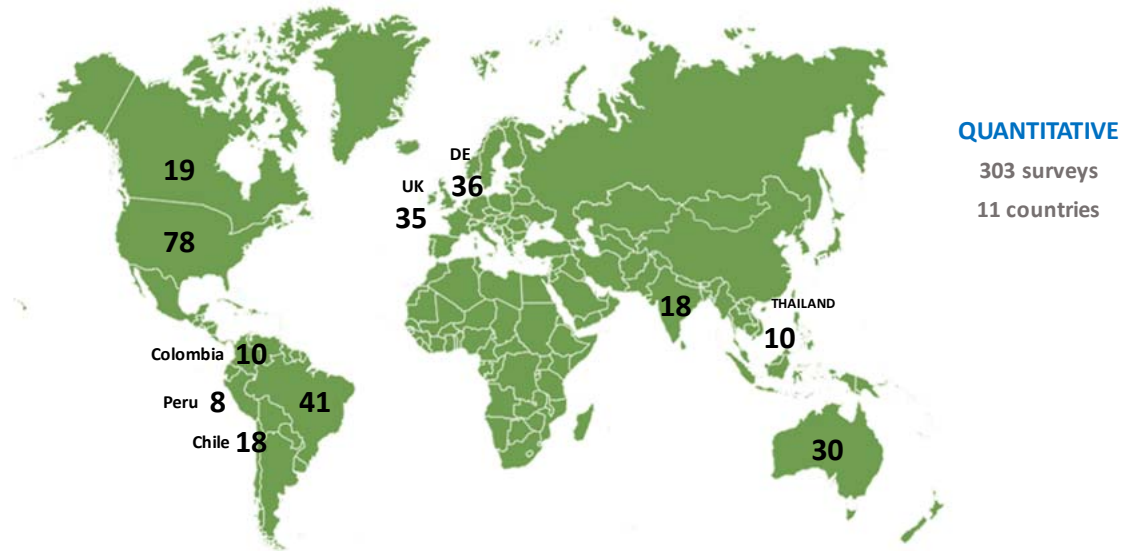
	Gen Pop	Unconcerned	Fearful Fanatics
<i>I don't understand why people are so worried about germs</i>	43%	67%	9%
<i>Careful food preparation is the best thing you can do to prevent illness</i>	82%	69%	94%
<i>I don't like to seem too fussy about germs</i>	62%	77%	19%
<i>Daily cleans kitchen sink / bathroom sink</i>	63% / 30%	-15%	+20% / 35%
<i>Hand washing per day</i>	8.63	5.67	11.85



Source: Global Germ Segmentation study, Kimberly-Clark, 2013 (N>15,000).

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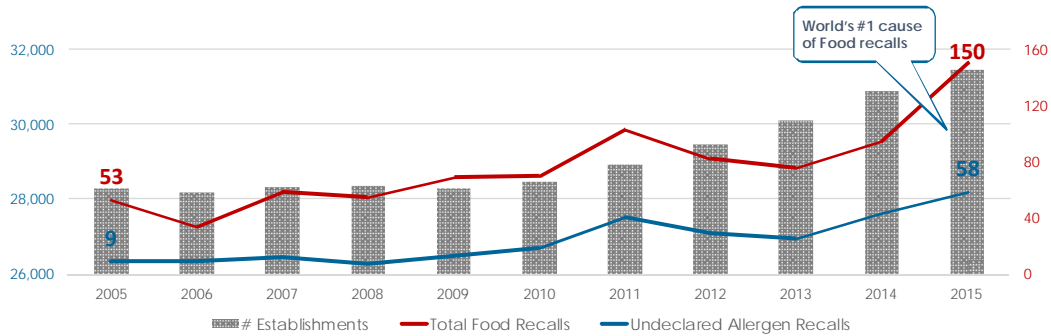
# GeoStrategy Partners Research



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## Hand hygiene compliance is a real risk in food processing.

FACILITIES VS RECALLS – USA



Source: GeoStrategy Partners Global survey of QA managers in Food Processing facilities; U.S. Bureau of Labor Statistic

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**Guidelines for interpretation of swab results**

The standards available include:

Health Act (Act 63, 1977)	SABS 049	
< 100cfu/cm <sup>2</sup> (no more than 100 bacteria / cm <sup>2</sup> )	<15 cfu / 1000 mm <sup>2</sup>	Satisfactory
	16-75 cfu / 1000 mm <sup>2</sup>	Fairly Satisfactory
	< 75 cfu / 1000 mm <sup>2</sup>	Unsatisfactory
Comments: 1000 mm <sup>2</sup> = 10 cm <sup>2</sup>		

Swift's recommendations:

POINTS	BACTERIAL COUNT	COMMENTS
5	<10 cfu / 10 cm <sup>2</sup>	Excellent
4	10-70cfu / 10 cm <sup>2</sup>	Good
3	71-99cfu/ 10 cm <sup>2</sup>	Acceptable
2	100-1000cfu/ 10 cm <sup>2</sup>	Unacceptable, requires attention
1	>1000cfu/ 10 cm <sup>2</sup>	Unacceptable, requires immediate attention

Source: Swift Microbiological Labs for the Food Processing Industry

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