

Sources: <sup>1</sup>National Diabetes Statistics Report, 2014 (released June 10, 2014) http://www.diabetes.org/diabetes-basics/statistics/?loc=db-slabnav#sthash.GuDGFjin.dpuf. Accessed April 9, 2015 | <sup>2</sup>Gregg EW et al. N Engl J Med 2014;370:1514-1523 | <sup>3</sup>ational Institute of Diabetes and Kidney Diseases 2009 |

### WHAT HAPPENS IN 1 SECOND OF THE INTERNET







## Why Flu & Diabetes?

We need deeper understanding to increase flu vaccine coverage





# 3-Step pilot experimentation approach



- Scientific data review make sure we don't find what is already known
- Using natural language processing, machine learning, deep learning
- Design methodology for understanding patient behavioral phenotypes
- Run small scale real-world pilots
- Experience building a datamart that unites google, sanofi and publicly available data
- Emphasis on country level implementation



# GOOGLE: METHODOLOGY



We used **VaxiTrends**, a proprietary dataset, to identify variables influencing vaccine uptake among adults in the U.S., China, France, Mexico, and U.K. We combined the data with **National Health Interview Survey** results from the CDC, which offer insights into health behaviors of Americans with diabetes.

This information was aggregated with data from **Google FluTrend**, which signals flu incidence, & Google Trends Application Programming Interface, which tracks search keyword popularity by location & date in a de-identified fashion.

Cluster analyses indicated factors most positively & negatively associated with acceptance & adherence



Liska, J, Gupta A et al. D Using Claims and Consumer Wearable Devices Data to Quantify Influenza-Related Outcomes among Type 2 Diabetes Patients—A Large Population Study [abstract]. ADA, Orlando, June 22, 2018.

# GOOGLE: RESULTS

factors impacting flu vaccination vary by country for people living with diabetes

	USA	UK	France	China	Mexico	
	Triggers to Action	Doctor Relation	Triggers to Action	Chronic conditions	Triggers to Action	
	Vaccine Trust	Triggers to Action	Doctor Relation	Weak Immune condition	Age	
	Doctor Relation	Vulnerability	Vulnerability	Beliefs and Perception	Chronic Condition	
	Chronic Conditions	Chronic Conditions		Vulnerability	Severity of flu	
	Beliefs and Perception	Beliefs and Perception	Beliefs and Perception	No Chronic conditions	Beliefs and Perception	
	Risk Perception	Risk Perception	Doctor Relationship	<b>Risk Perception</b>	<b>Risk Perception</b>	

Ordered in terms of importance from Highest influencer to Lowest

SANOFI PASTEUR 🌍

# Google Flu Trends Offers Regional Granularity





### Using Google Cloud and Predictive Analytics to Promote Influenza Vaccination Among People with Diabetes

Jan Links - Sanoff, Patient Solutions, Paris, France Aschine Gupta - Olubel Solutions, George Cloud, USA Agua Thomson - Sanoff Parisez, Olobel Medical Affeire, Lyon, France Sandrine Samoon - Sanoff Parisez, Olobel Medical Affeire, Lyon, France Harry Hills - Second Pasteur, Octobal Medical Affrica, Loop, France Michael Greenberg - Second Pasteur, Octobal Medical Affrica, Loop, France Milled Kambalkar - Second, Information Technology Solutions, USA Anna Basi - Second, Pasteur Schuling, Barle, France

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To combine novel datasets and dynamic modeling techniques to identify the behavioral determinants of influenza vaccination in people living with diabetes, and to use these insights to tailor flu vaccination interventions and campaigns to the psychosocial and contextual characteristics of different populations.

### RACKOROLIND

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### METHODS

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### RESULTS:

 Our analysis remained that people in regions with increasing the activity tend to either some to rescale the considerent with they then if he alth habeshy that hall that security will have active if they particular, a section of head, and are concerning the presented with an accessible, effective actuation. Your is practices and incomedys of the ferness also dedegateling characteristics of people who were adhered to vaccinative recommendations.

We found watering access countries and company. For example, marked status was associated with otherways in France and the U.F., but active the U.S., while concern about influence recollection transmitting influence may an important matching in the U.S. and U.F. betraat Praces. Among U.S. receiveds, case to active (e.g., readeders), vecaluation additable (e.g., loar of side effects or openance to flar recoinci, and convend beckers (e.g., eccess and a Northoldity) appear to have the product impacts on manifestive state.

This process revealed opportunities to intervene. Individual addebine alter fits recollection adherance rate (DL27), among all residents according to CDCs, people need to execute for the vehicle is a positive indicator of adherence, but they also execute using terms made as "side effects of fly" and "Reafter fle clot," which may belo explain lower adherence.

### FUMINATE

 No evaluated the constation of each of the 120 base in the Vacinesia depend on for a discussion in each country using differential testing. This process identified 25 variables that approved to impact afflernous rates; we focused on 22 variables for which we had done on exclusion who were adhered and non-adhered works. counties and scenistics secure as. We find and mechine burning to being one to study the introphy of different variables, formed inputteeness such as reveald noneone could afford a perticular veccinetion, how did other factors beyond cost inference that behavior? No identified variables with the attrangent positive and months is fearers.

### CLUSTER

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### GENERATE ADDITIONAL EVIDENCE

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### LIMITATIONS:

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The WHX depart provided important detail about the democratikit and behavioral characteristics of Associates thing with diabetes, including so most littles. This information mus not available is obsy countries, instacting our shifty to draw more sympler instalts shout subcombatives.

- bitre corrected dete-indeling patient aported occurres date, heidth system data such as hearence types, and assesses of a patient's suparament with the builtic are system, for instance-may be reached to catinize this model and anhance its predictive power. For manple, to befor understand how interactions between patients and that headth care providers shape vaccin atten bellowing, data on beathness provider of attitudes, balaris, and industrion regarding recollection would be needed.

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### GOOGLE: RESULTS

Google created a country specific dashboard for local users to identify behavioral drivers of flu vaccination & the most receptive subgroups to design tailored interventions to increase uptake





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# THANK YOU

