# Invitae
# Jefferson Population Health Workshop

*"Genome Management for Life: Vision or Reality"*

INVITAE

# THE FOURTEENTH POPULATION HEALTH COLLOQUIUM

"Population Health and patient-centered care are at the heart of the Affordable Care Act (ACA)."

"All of the stakeholders across the health care ecosystem must be prepared to collaborate and integrate at an unprecedented level to achieve meaningful changes that will improve patient outcomes."

"Population-based medicine and wellness and prevention are squarely at the forefront of health care".

# Today’s Workshop Agenda

- Objectives and Goals of Today’s Workshop
- Overview: Invitae Corporation
- “Genome Management for Life: Vision or Reality” Presentations and Group Discussion
- Wrap-up: Summary of Recommendations and Next Steps

# Objectives and Goals of Today's Workshop

- Understand the challenges and opportunities that exist for diagnosis/prevention/wellness programs built around genetics in population-health directed programs.
- Understand the factors influencing the use of genetic testing in clinical decision making and integration into existing healthcare systems.
- Discuss how "genome management" can be developed and incorporated into a population health program and be utilized as a successful tool for the health management of individuals.
- Gain a better understanding from today's workshop attendees on current and future best practices for a genomic management partner such as Invitae to contribute to successful population health programs.

# Today’s Workshop

- Today’s meeting should be as interactive as possible.
- The agenda is designed for you to provide us your feedback on issues critical to the future development of a successful population health genome management program. Everyone should be an active participant.
- Please share with us your ideas throughout the workshop on additional resources and clinical information you feel we can provide to support a successful genome management program.
- Thank you for participating today. Your opinion and experience are key to the development of a successful genome management program. We will follow-up on each of the ideas and questions generated from today’s discussion.

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# Corporate Overview
# Jefferson Population Health Workshop
# March 2014

Stan Skrzypczak
Business and Corporate Development
bd@invitae.com

# Invitae Background

Invitae, a genetics information company, has raised $87 million in capital to bring comprehensive genetic information into routine medical practice.

•More than 100 people reinventing the genetic testing business

•First-in-kind commercial product launch Nov. 19, 2013 – 218 genes - $1,500

▪Principal investors
- Baker Brother Investments
- Thomas McNerney Partners
- Randy Scott
- Genomic Health
- Genesys Capital
- Casdin Capital
- Redmile

A team with unparalleled experience

Lisa Alderson, Commercial
Disney, Crossloop, Genomic Health

Lee Bendegkey, Finance & Legal
Incyte, Nuvelo, DNAnexus

Michele Cargill, Science & Genetics
Navigenics, Affymetrix, Celera

Alex Furman, Software Development
Navigenics, Iris Financial Solutions

Sean George, Technology & Development
Navigenics, Affymetrix, Invitrogen

Jill Hagenkord, Medical
Complete Genomics

Steve Lincoln, Informatics
Complete Genomics, Affymetrix, Incyte

Randy Scott, Strategy
Genomic Health, Incyte

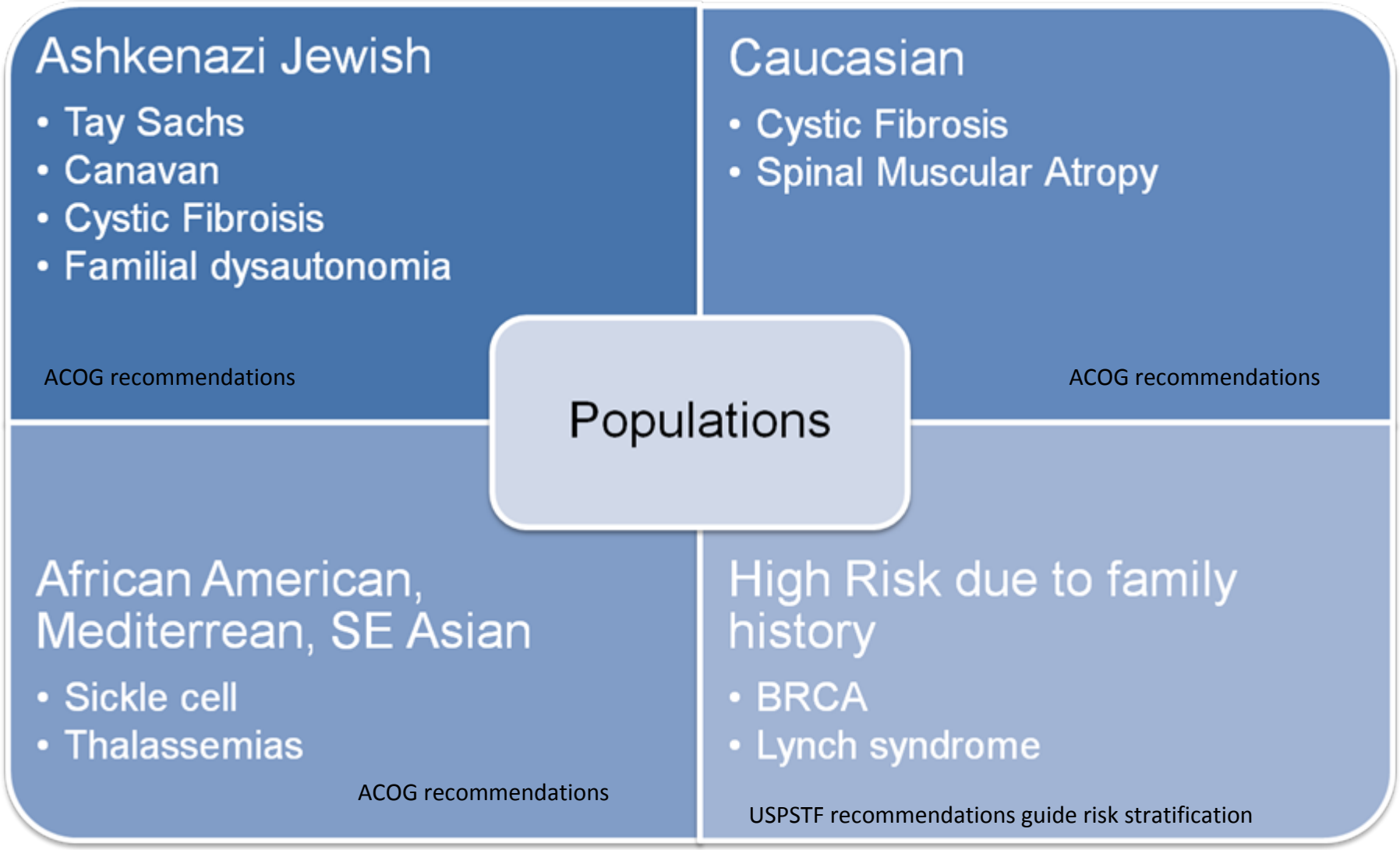
Jon Sorenson, Bioinformatics
Pacific Biosciences, Applied Biosystems

# Our long term vision

what: To bring comprehensive genetic information into routine medical practice to improve the quality of healthcare for billions of people

how: By aggregating the world's genetic tests into a single service with better quality, faster turnaround time, and a lower price than most single-gene diagnostic tests today

# Population-based genetic testing is already widely used



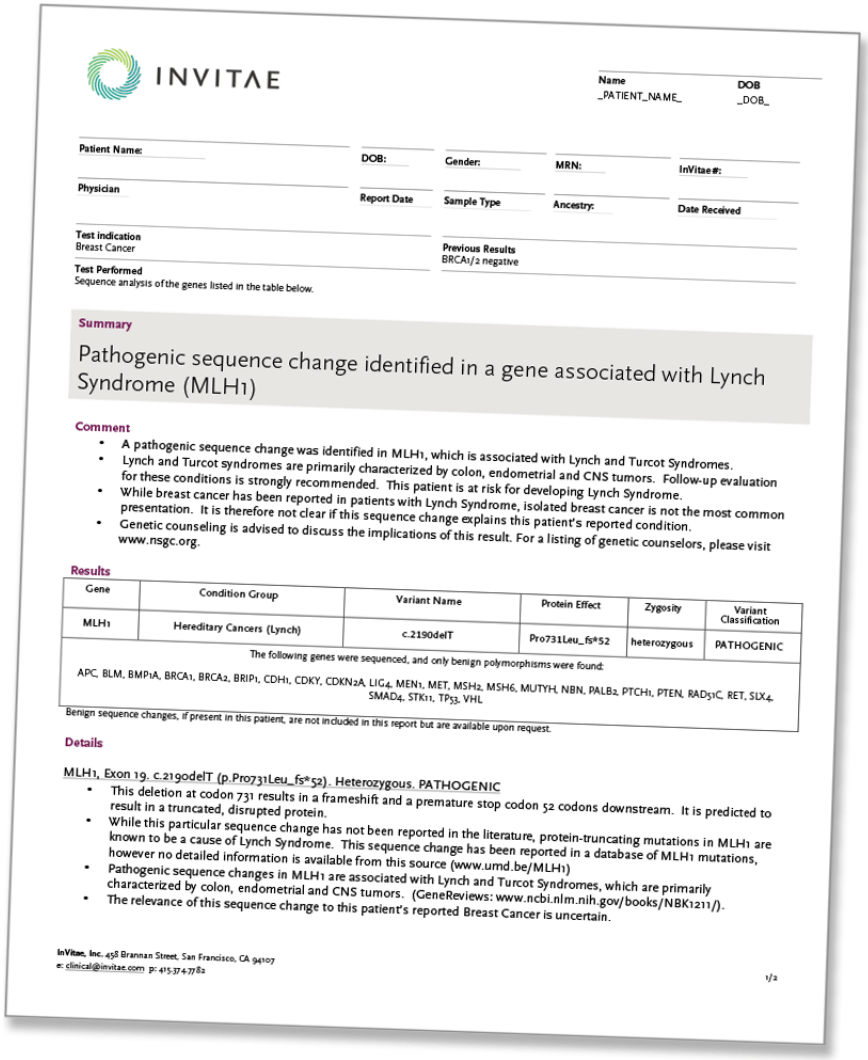
# “Genome Management for Life: Vision or Reality” Discussion Topics

- Introduction and Program Overview:
  - Stan Skrzypczak, MS, MBA, Vice President of Business Development, Invitae
- Towards Precision Medicine: Moving from Illness to Wellness
  - Steven Tucker, MD, Novena Specialist Center, Singapore
- Practical Considerations for the Delivery and Use of Genetics in Routine Care with New Technologies:
  - Patrick Terry, CEO, Grey Group Ventures
- Genome Management and It’s Relationship to Population Health:
  - Randy Scott, PhD, CEO and Co-founder Invitae
- Moderated Discussion:
  - Led by Stan Skrzypczak, Invitae

# A Case Study Exemplifying "Genome Management"

- Female ~45y, presenting with breast cancer
- BRCA1/2 Negative
- Consented to biobank a blood sample ~8 years ago

- In this study, shown to be MLH1 positive (Lynch)
- Re-contacted: She had Dx of endometrial cancer in the intervening period
- Additional colonoscopy performed: Positive (polyps found and removed)



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Name _PATIENT_NAME_ DOB _DOB_

Patient Name: DOB: Gender: MRN: InVitae #:

Physician Report Date Sample Type Ancestry: Date Received

Test indication: Breast Cancer

Previous Results: BRCA1/2 negative

Test Performed: Sequence analysis of the genes listed in the table below.

**Summary**

Pathogenic sequence change identified in a gene associated with Lynch Syndrome (MLH1)

**Comment**

- A pathogenic sequence change was identified in MLH1, which is associated with Lynch and Turcot Syndromes.
- Lynch and Turcot syndromes are primarily characterized by colon, endometrial and CNS tumors. Follow-up evaluation for these conditions is strongly recommended. This patient is at risk for developing Lynch Syndrome.
- While breast cancer has been reported in patients with Lynch Syndrome, isolated breast cancer is not the most common presentation. It is therefore not clear if this sequence change explains this patient's reported condition.
- Genetic counseling is advised to discuss the implications of this result. For a listing of genetic counselors, please visit www.nsgc.org.

**Results**

| Gene | Condition Group | Variant Name | Protein Effect | Zygosity | Variant Classification |
|---|---|---|---|---|---|
| MLH1 | Hereditary Cancers (Lynch) | c.2190delT | Pro731Leu_fs*52 | heterozygous | PATHOGENIC |

The following genes were sequenced, and only benign polymorphisms were found:

APC, BLM, BMP1A, $BRCA_1$, $BRCA_2$, $BRIP_1$, CDH1, CDKY, $CDKN_{2A}$, $LIG_4$, $MEN_1$, MET, $MSH_2$, MSH6, MUTYH, NBN, $PALB_2$, $PTCH_1$, PTEN, $RAD_{51C}$, RET, $SLX_4$, $SMAD_4$, $STK_{11}$, $TP_{53}$, VHL

Benign sequence changes, if present in this patient, are not included in this report but are available upon request.

**Details**

MLH1, Exon 19, c.2190delT (p.Pro731Leu_fs*52), Heterozygous, PATHOGENIC

- This deletion at codon 731 results in a frameshift and a premature stop codon 52 codons downstream. It is predicted to result in a truncated, disrupted protein.
- While this particular sequence change has not been reported in the literature, protein-truncating mutations in MLH1 are known to be a cause of Lynch Syndrome. This sequence change has been reported in a database of MLH1 mutations, however no detailed information is available from this source (www.umd.be/MLH1)
- Pathogenic sequence changes in MLH1 are associated with Lynch and Turcot Syndromes, which are primarily characterized by colon, endometrial and CNS tumors. (GeneReviews: www.ncbi.nlm.nih.gov/books/NBK1211/).
- The relevance of this sequence change to this patient's reported Breast Cancer is uncertain.

InVitae, Inc. 458 Brannan Street, San Francisco, CA 94107
e: clinical@invitae.com p: 415-374-7782

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# Genetic testing has the largest market possible… everyone on the planet.