Artificial Intelligence in Ophthalmology: From Innovation to Implementation

NEW ORLEANS ACADEMY OF OPHTHALMOLOGY

Disclosure Statement

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About the Presenter

Jeffery Daigrepont, Senior Vice President at Coker, specializes in healthcare automation, system integration, cybersecurity, operations, and deployment of enterprise information systems for large integrated delivery networks and medical practices. His specific interests deal with data migration, vendor contracting, strategic IT planning and optimization, security, and compliance.

A popular national speaker, Jeffery is frequently engaged by highly respected organizations across the nation, including many non-profit trade associations and state medical societies. He has co-authored a top-selling book, Complete Guide and Toolkit to Successful EHR Adoption (2011 HIMSS) and is a contributor to The Healthcare Executive's Guide to ACO Strategy (2015 HCPro).

Jeffery Daigrepont

Senior Vice President

Learning Objectives

At the conclusion of this session, participants will be able to:

1. **Explain** the fundamental principles and terminology of artificial intelligence and machine learning relevant to ophthalmology.
2. **Analyze** the strengths, limitations, and validation methods of current AI-based diagnostic and decision-support tools.
3. **Differentiate** trustworthy AI applications from those lacking adequate evidence, transparency, or bias mitigation.
4. **Apply** ethical, regulatory, and clinical frameworks (e.g., FDA, NIST, AAO) to evaluate readiness for implementation.
5. **Integrate** responsible AI practices into clinical and operational workflows to enhance patient care and trust.

The future of AI in ophthalmology provides a glimpse into technological transformation in vision science.

This presentation emphasizes clarity, evidence-based trends, and forward-looking perspectives

Artificial Intelligence in Ophthalmology (The Fundamentals)

Photo Credit: Stock Adobe

Key Concepts

- **Artificial Intelligence (AI):** Algorithms that mimic human decision-making to interpret clinical data.
- **Machine Learning (ML):** Systems that learn patterns from imaging and EHR data to improve prediction accuracy.
- **Deep Learning (DL):** Neural networks—especially **CNNs**—optimized for ophthalmic imaging (e.g., OCT, fundus).
- **Supervised vs. Unsupervised Learning:**
  - *Supervised* models learn from labeled pathology (DR, AMD, glaucoma).
  - *Unsupervised* models discover new phenotypes or clusters.
- **Key Metrics:** Sensitivity, specificity, calibration, generalizability.
- **Ophthalmology Relevance:** Image-heavy specialty makes it ideal for DL-enabled screening, segmentation, and progression modeling

- **Strengths, Limitations & Validation of AI Diagnostic Tools**

Strengths

High performance in image recognition tasks (DR, AMD, glaucoma).
Scalable screening in primary care, retail health, and underserved settings.
Consistent interpretation with reduced human variability.

Limitations

Performance may drop with different imaging devices, demographics, or comorbidities.
Limited transparency (“black box” models).
Risk of overfitting if trained on narrow datasets.

Validation Requirements

External validation across sites, devices, and diverse populations.
Prospective clinical trials and real-world performance monitoring.
Human factors testing for workflow integration.
Evaluation of **bias**, **false positives/negatives**, and **clinical impact**.

- **Identifying Trustworthy vs. Untrustworthy AI**

Characteristics of Trustworthy AI

Evidence-backed: Peer-reviewed studies, transparent methodology, strong external validation.
Explainability: Clear model rationale or visual heatmaps showing decision drivers.
Bias Mitigation: Training data reflects diverse age, race, imaging device, and disease stages.
Robust Governance: Data lineage, version control, monitoring, and risk assessments.
Regulatory Alignment: Meets UL 2933, NIST AI RMF, AAO guidelines.

Warning Signs of Untrustworthy AI

No published validation or undisclosed datasets.
Claims that exceed the evidence (e.g., broad disease detection with small datasets).
Inconsistent performance across populations or devices.
Lack of transparency in data use, model updates, or error rates.

- **Integrating Responsible AI into Clinical Workflows**

Workflow Integration

Align AI tasks with existing imaging, triage, and decision-support pathways.
Ensure seamless **EHR documentation**, clinical routing, and follow-up steps.
Use AI for augmentation (screening, prioritization), not autonomous clinical judgment unless FDA-cleared.

Operational Practices

Establish AI governance committees (clinical, IT, compliance, risk).
Develop protocols for human oversight, escalations, and override scenarios.
Continuously monitor model drift, error patterns, and user feedback.

Patient-Centered Practices

Transparent communication: how AI is used and its benefits/limitations.
Ensure equitable access and remove bias that could impact outcomes.
Build patient trust through safe, consistent, evidence-based deployment.

Where is this going? Could Agentic AI replace the EHR entirely??? Many speculate it will!

- Software as a Service will soon become AI Agents as a Service
- The new UI is no UI (Smart Sensors)
- No Keyboard or Monitors

Why the Theory Makes Sense:

1. **Frictionless Data Capture** – Voice + sensors (wearables, IoT devices, computer vision) could eliminate the need for manual typing, dramatically improving clinician efficiency and patient interaction time.

2. **Contextual Understanding** – Agent AI could interpret conversations, lab results, imaging, vitals, and patient history in real time, then auto-populate structured records without human data entry.

3. **Interoperability Leapfrog** – Instead of building on top of rigid EMR databases, Agent AI could work across systems as an orchestration layer, bypassing legacy user interfaces entirely.

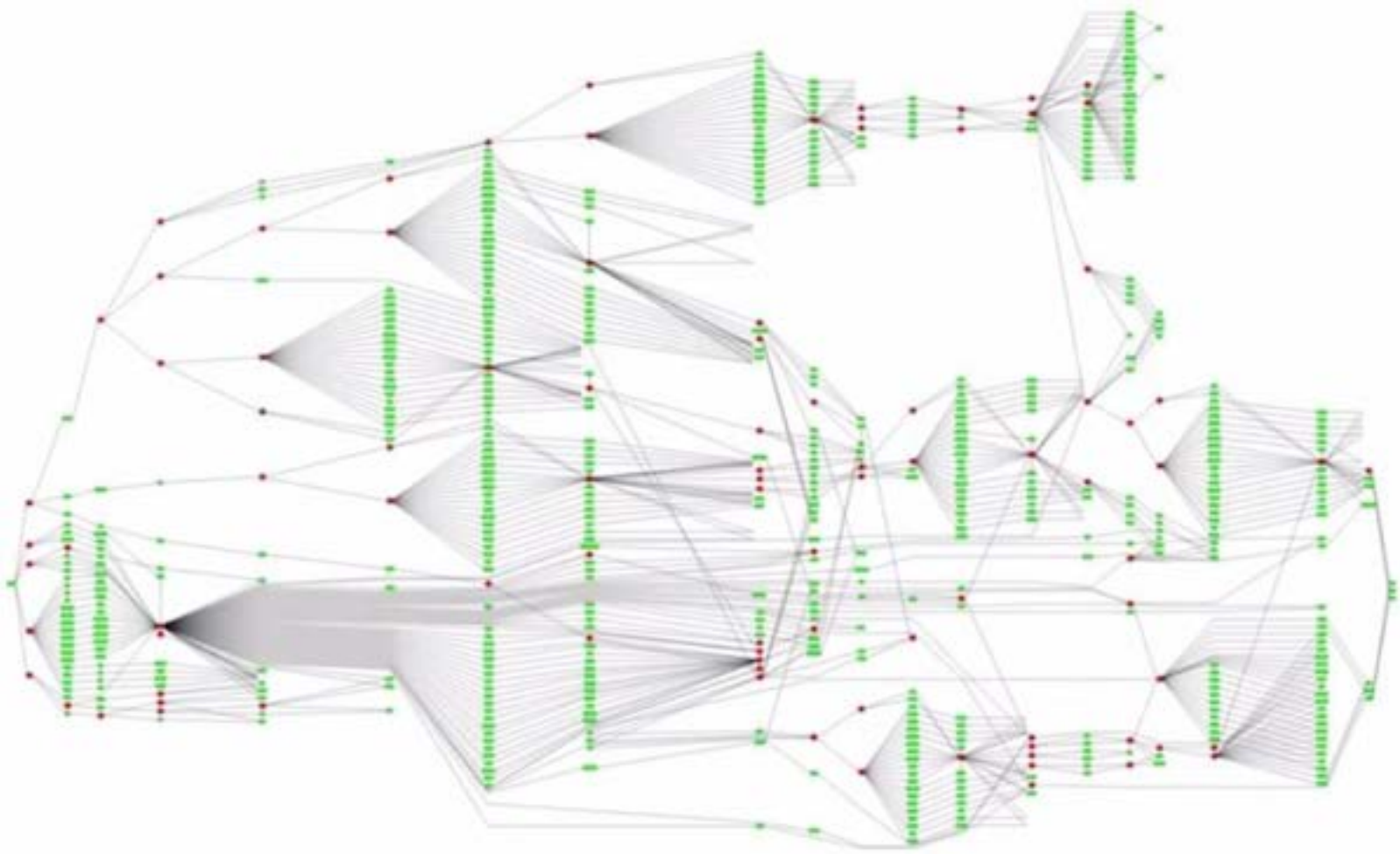
My prediction on this…

Most Likely Path - I don't see Agent AI *wholly* replacing EMR vendors in the near term.

Instead:

Short Term (1–3 years) – Agent AI will act as a *co-pilot* to existing EMRs, sitting in on patient encounters, transcribing, coding, and entering data into existing fields.
Medium Term (3–7 years) – Some specialty-specific or ambulatory care settings could adopt "EMR-lite" models where the AI agent becomes the primary interface, with a minimal underlying system for regulatory compliance.
Long Term (7–10+ years) – We could see a complete inversion, where the EMR is reduced to a compliant back-end database, and Agent AI is the *front door* for all interaction—clinicians rarely touch the traditional UI.

AI Logic



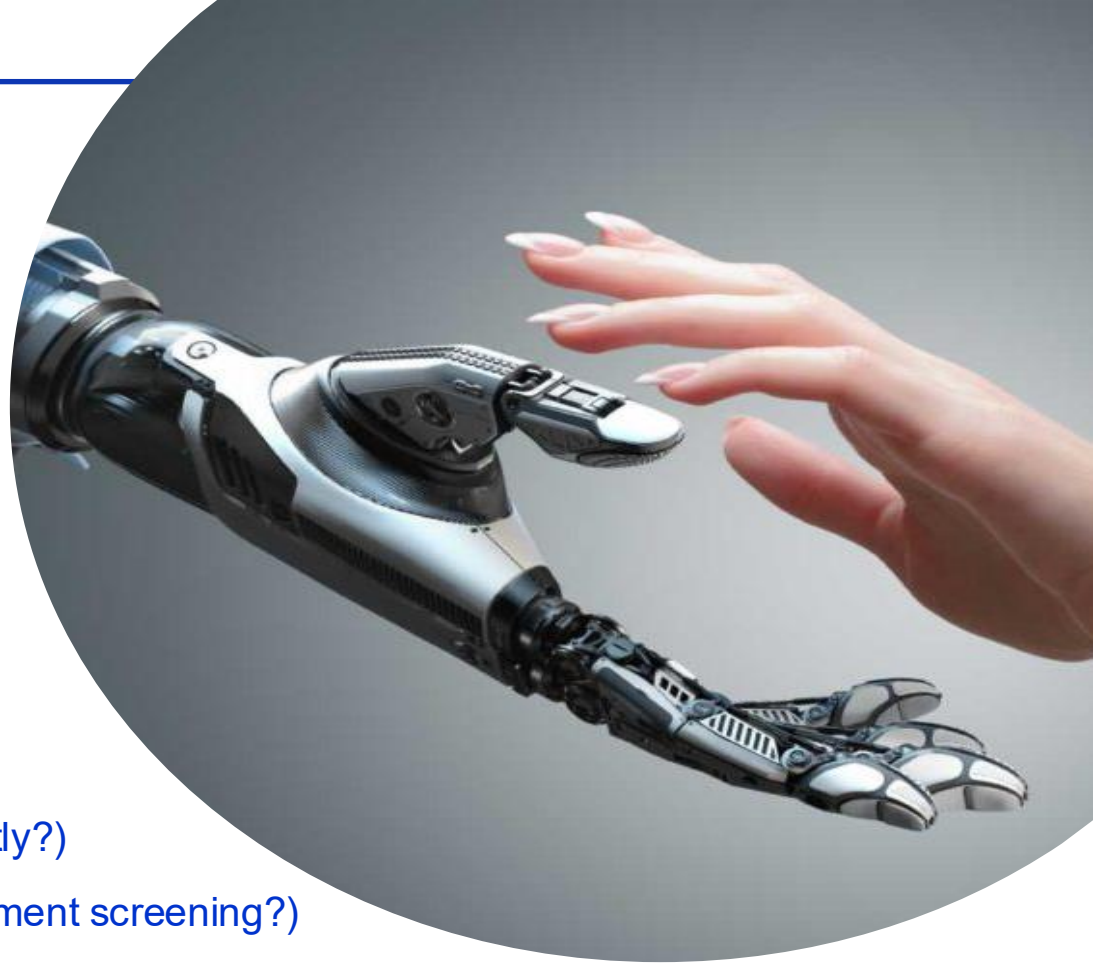
Happening Now..

Transforming Practice Management with AI

- **Operations**: Automates scheduling, EHR data entry, and resource allocation to boost efficiency.
- **Patient Access**: Enhances engagement with AI chatbots, telehealth integration, and accessible screening tools.
- **Compliance**: Ensures accurate coding, tracks regulations, and supports audits to minimize errors.
- **Security**: Protects patient data with AI-driven cybersecurity and fraud detection.
- **Revenue Cycle Management (RCM)**: Streamlines insurance verification, reduces claim denials, and optimizes cash flow.

Photo Credit: AI Generated

AI Concerns and Risks



- AI discrimination such as bias or racism (see: Microsoft Tay)
- Inequality (how do we distribute the wealth created by machines?)
- Evil AI (e.g., cures cancer by destroying humanity)
- AI Rights (can non-humans have rights? A: See Corporations)
- Humanity (how do machines affect our behavior and interaction?)
- IP developed by AI (who owns it?)
- Causing harm (who is at fault?)
- Privacy and consent (facial recognition, tagging)
- AI can now predict the propensity to pay (are these patients treated differently?)
- AI can now predict the propensity to commit crimes (should it be for employment screening?)
- Security (how do we keep AI safe from adversaries?) (threat monitoring)
- Limitation (requires access to the cloud and enormous amounts of data)
- AAO Guidance:
  - AI must complement, not replace clinician judgement
  - Prioritize safety, equity and continuous monitoring

Source: https://www.researchgate.net/publication/320826467_Exploring_Legal_Ethical_and_Policy_Implications_of_Artificial_Intelligence

1. Front Desk and Lobby (The Digital Front Door)
2. Patient Greeting Kiosk
3. Patient Check-In
4. Collect Copay and Put Credit Card on File
5. Patient Scheduling

6. Reminder Calls using Smart Bots
7. Self-Service Scheduling Portals
8. Patient Intake Forms
9. Mobile Intake
10. Patient Triage Bots

Real World Examples of AI Happing Now…

- **Thomas Eye**: Using AI to Automates EHR data entry and billing, reducing administrative workload by 30% and claim denials by 15%.
- **Johns Hopkins Medicine**: AI diabetic retinopathy screening in primary care boosts access, increasing screening rates by 20% in underserved areas.
- **Mount Sinai New York:** AI chatbot streamlines scheduling and insurance verification, cutting no-shows by 25% and verification time by 40%.
- **EyeCare Partners**: AI cybersecurity reduces data breach risks by 35%, ensuring HIPAA compliance and secure patient data.
- **Verana Health**: AI analytics with IRIS Registry optimizes RCM, improving reimbursements by 10% and reducing denial costs by 20%.
- **Vance Thomas Vision in Sioux Falls** using AI solutions for clinicians, operations and billing, including denial management. Early indication has been remarkable improvements in provider productivity and reduced labor cost.
- **Heaton Eye Associates** is utilizing a full stack of AI tools from ambient listening to virtual assistance

Examples are actual health systems using AI

AI and Tech Trends in Healthcare

- Precision Medicine
- Digital Health
- Care Anywhere
- Consumerism
- Integration of individual healthcare delivery into population/public health functions
- Data Analytics and Artificial Intelligence
- Interoperability
- Cloud Computing
- Centralized models of clinical decision support
- 21 Century Cures Act

AI in Cybersecurity

Vulnerability Scans

3

Insider Threat Monitoring

2

4

Chat-Bot
Managed Call Centers

Self-Health Networks

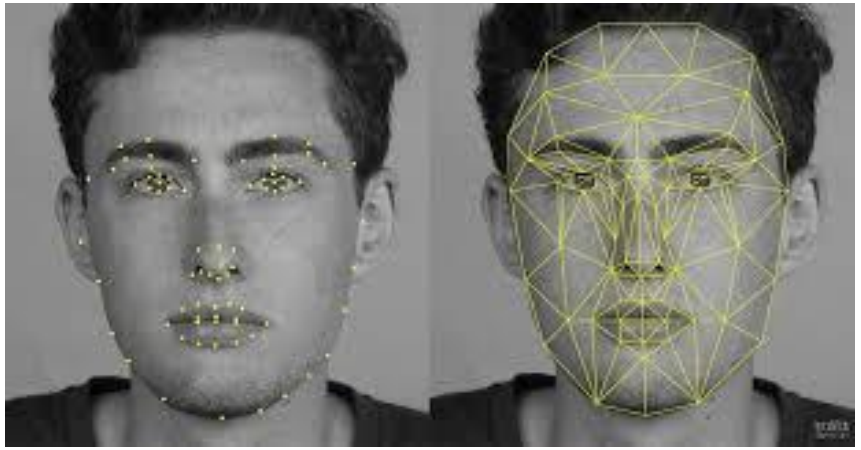
1

5

Self-Service Help
Desk and Ticketing System

Facial Recognition

- Detection of non-employees interacting with PHI or entering into secure areas
- Advanced knowledge of patients entering the building who may require special services (Wheelchair, translator)
- Triggers check in processes
- Alerting the campus of a hostile/threating patient
- Active shooter/terrorist in the area



Leveraging AI Electronic Patient Communications

Negotiate an IT Contract Like a Pro

Strength in Numbers

Knowledge Sharing

Vendor Demonstration Tools

- Score Cards
- Demo Scenarios
- Scribe my exam

Specialty-specific RFPs

Reference Check Tools

Site Visit Tools

Tools for Comparing Cost, Including Recurring Cost

HCIT User Conferences/Summits/Forums

HCIT Workshops in Conjunction with Annual Meeting

Formal Strategies

Displacement Guidance

Hospital Alignment/Community Connect

Ways to Negotiate

- Initial costs
- Hardware cost
- Software cost
- Communications cost
- Installation cost
- Ongoing support cost
- Implementation cost
- Support cost
- Technical support cost
- Integration costs
- Interface cost
- Entitlement to new releases/bug fixes
- Cost of tailoring
- Future upgrades and releases (this should always be at no additional cost)

Modifying the Contract

- Source code
- Acceptance period (hardware and software)
- Implementation caveats
- No front loading of support fees
- No front-loading the purchase terms
- Assignment
- Future upgrades and new releases
- Copyright infringements
- Warranties
- Termination
- Future providers and fees (recurring cost)

Emerging Trends

Expansion from detection to prediction (e.g. risk modeling for disease progression)

Integration with wearable and mobile diagnostic tools

Increased use in screening programs and teleophthalmology

Personalized medicine

AI enables individualized treatment plans by analyzing multimodal data

Combines genetic, imaging, and clinical history for personalized insights

Potential to optimize treatment efficacy and reduce adverse outcomes

Global impact and accessibility

AI facilitates eye care delivery in remote and underserved regions

Portable AI devices allow frontline workers to screen for vision-threateningdiseases

Democratization of care through scalable AI platforms

Integration with other technologies

Synergy with robotics, augmented reality (AR), and virtual reality (VR)

Real-time intraoperative decision support using AI

Fusion of AI with EHRs for holistic patient care management

Challenges and considerations

Ethical concerns: bias, transparency, and data privacy

Regulatory barriers to clinical deployment and approval

Need for robust validation and clinician oversight

Research directions

Development of explainable AI (XAI) for clinical interpretability

Training models on large, diverse, and labeled datasets

Exploring AI’s role in predicting systemic disease via ocular imaging

Conclusion

The future of AI in ophthalmology is promising but requires careful guidance

Interdisciplinary collaboration is vital to ensure safety, efficacy, and equity

AI is not replacing clinicians—it is enhancing their capabilities

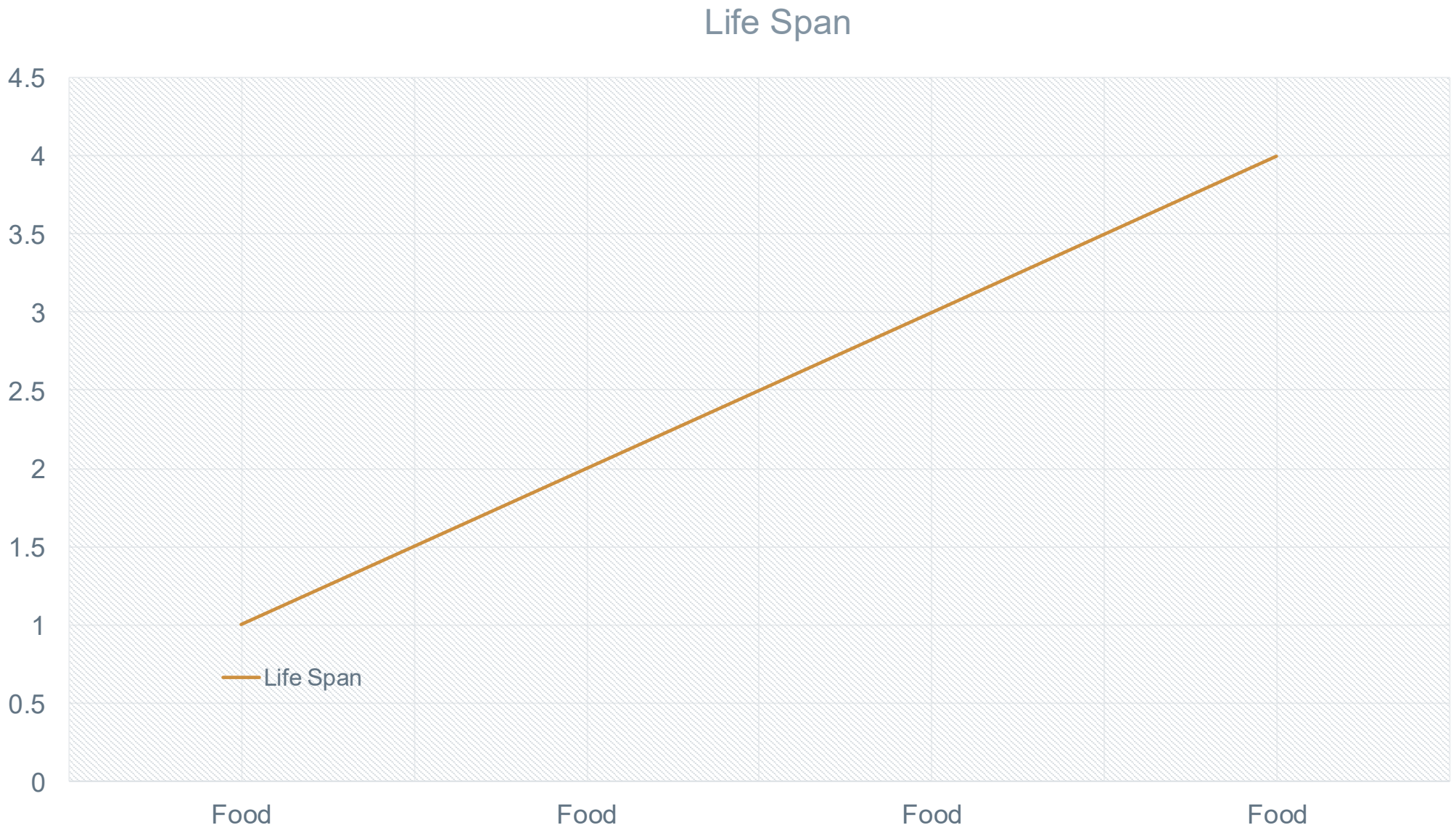
Final Thoughts

THE

BLACK SWAN

The Impact of the
HIGHLY IMPROBABLE

Nassim Nicholas Taleb


Life Span
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Life Span
Food
Food
Food
Food

Questions?


Thank You