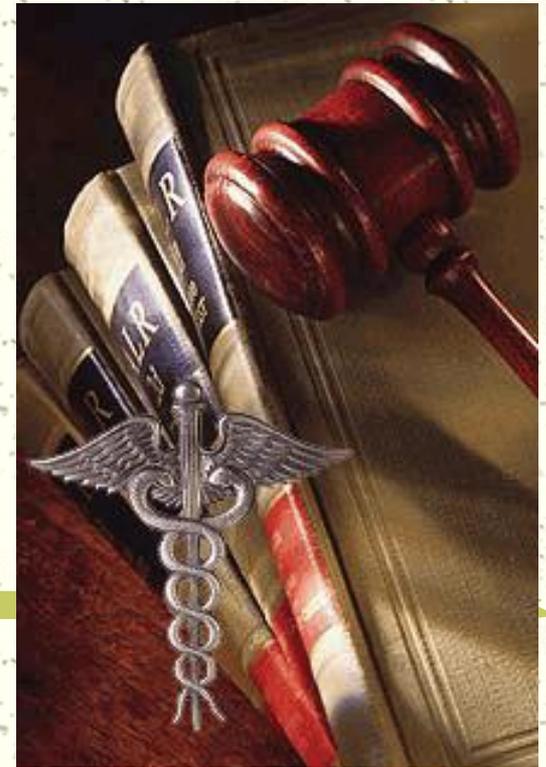


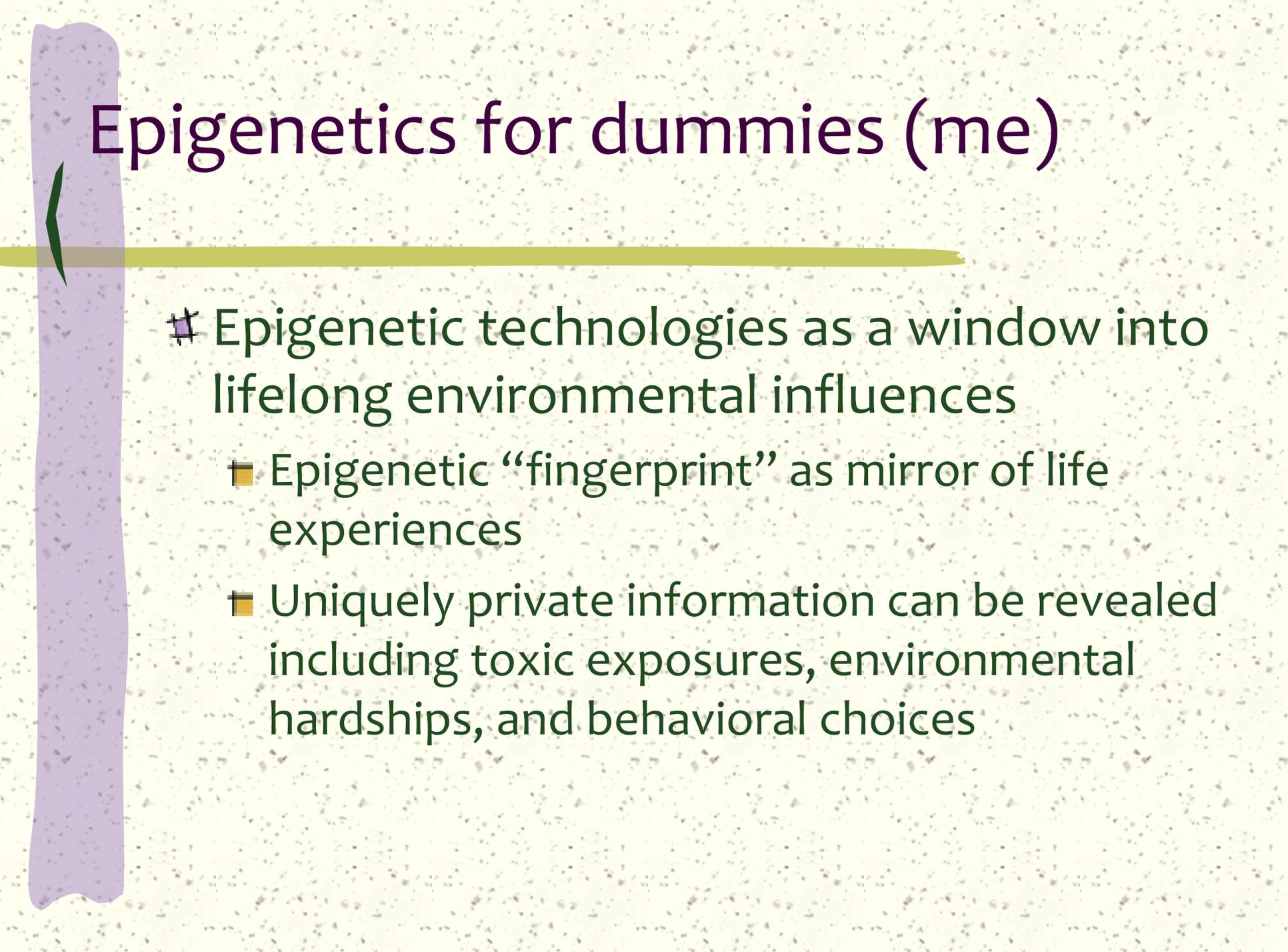
Neuro-epigenethics: Ethical and Legal Issues in Epigenetic Testing



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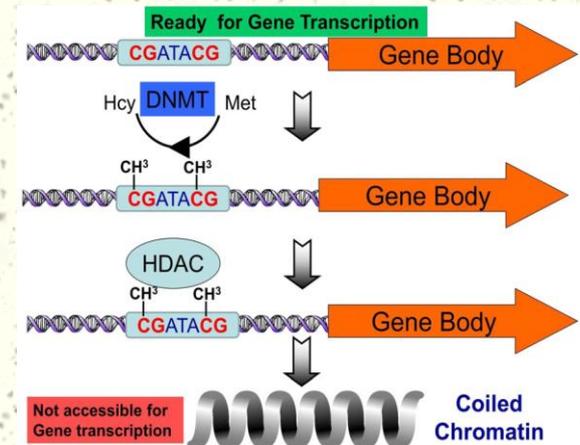
Epigenetics for dummies (me)



- # Epigenetic technologies as a window into lifelong environmental influences
 - Epigenetic “fingerprint” as mirror of life experiences
 - Uniquely private information can be revealed including toxic exposures, environmental hardships, and behavioral choices

Methylation of the DNA

- # Methyl groups (CH_3) attach to DNA at “CPG islands”
- # The methyl groups come from environmental exposure
- # The process is a response to substances: alcohol, tobacco, cannabis
- # This changes gene transcription



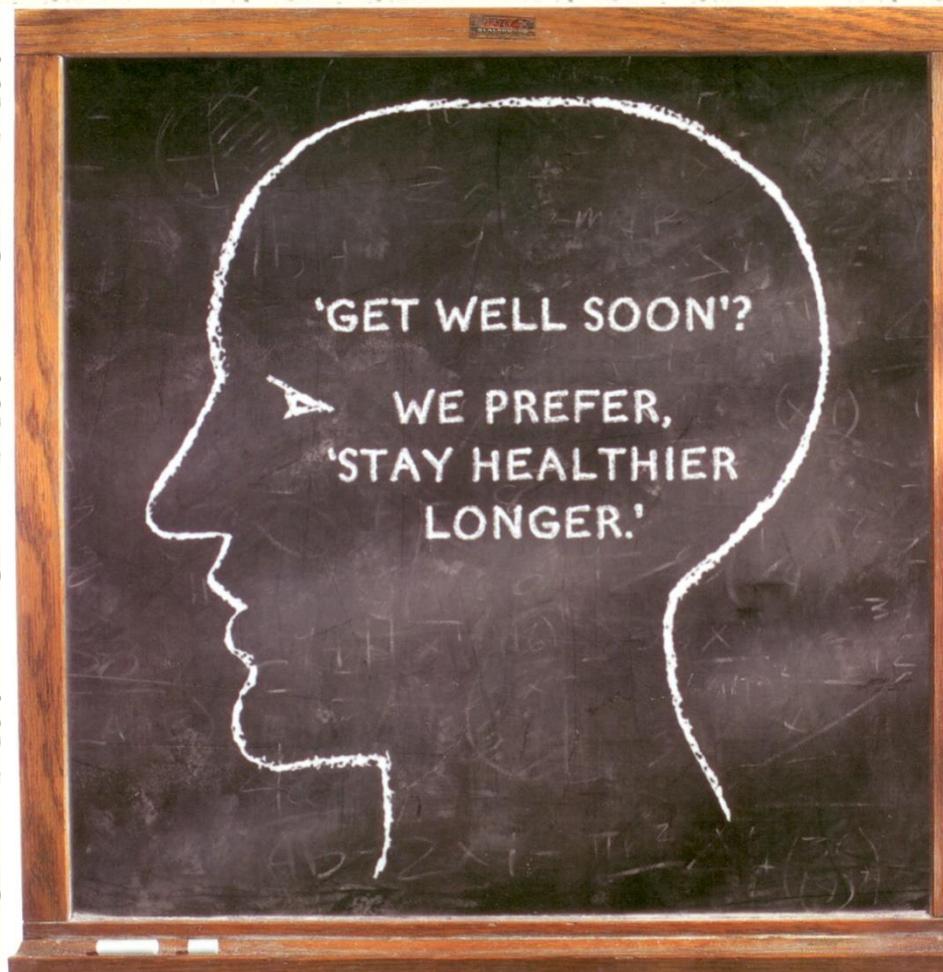
Why epigenetic testing can be good

- # The best way to remedy epigenetic changes is to prevent them before they become established
- # Early testing for alcohol, tobacco and cannabis may help identify those who can benefit from interventions of a behavioral or environmental nature
- # Assuming interventions are available... .. 4

Life planning through neuroscience

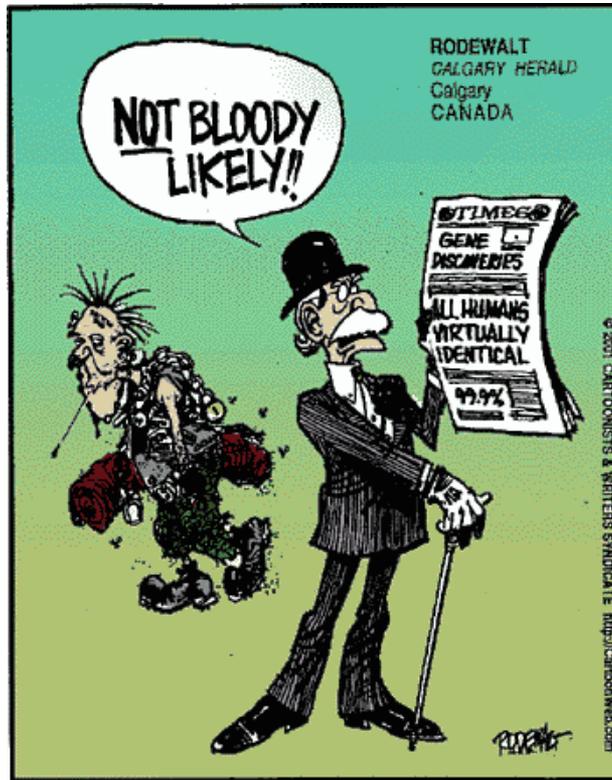
The question of “Whether I will get disease?” shifts to questions such as “When will I get the disease?”, “What can I do to delay disease onset?”, “How will the disease present itself in me?”, “When do I get a diagnosis?”, “When do I tell others?”, “How do I avoid being treated differently and discriminated against?”, “Can I prevent or change my genetic outcome?” and “What lifestyle factors can I change or modify to delay onset of symptoms?”

Neuro-epigenethics Goal #1



Changing conceptions of the self

- # In 1962 Justice Douglas wrote: “an approach of moral condemnation continues as respects drug addicts . . . [T]hose living in a world of black and white put the addict in the category of those who could, if they would, forsake their evil ways.”(Robinson v California, 1962)
- # In the 2000’s the view of addiction as a moral deficiency was mitigated by biological findings of brain plasticity
- # Epigenetics adds that rehabilitation is possible



Bias, stigma, dangerous heuristics

- # Behavioral psychology reveals the normal human tendency to make errors in thinking
 - Availability bias: how easily does someone who drinks alcohol and engages in bad behavior come to mind?
 - Anchoring bias: when we think of someone who used alcohol, tobacco, or cannabis it anchors our judgment of the person in front of us
 - Representativeness bias: This person is similar to others of the same sort

Heuristics of epigenetic information

Epigenetic reductionism

- assessing the presence of a single trait, rather than measuring a range of attributes, such as resilience, reasoning, physical stamina, or manual dexterity, any of which may be equally or more important to the task being performed

Prediction of individual ability

- an individual with no sign of substance use could fail at performance of the relevant task, while a person with evidence of substance use could excel at the task

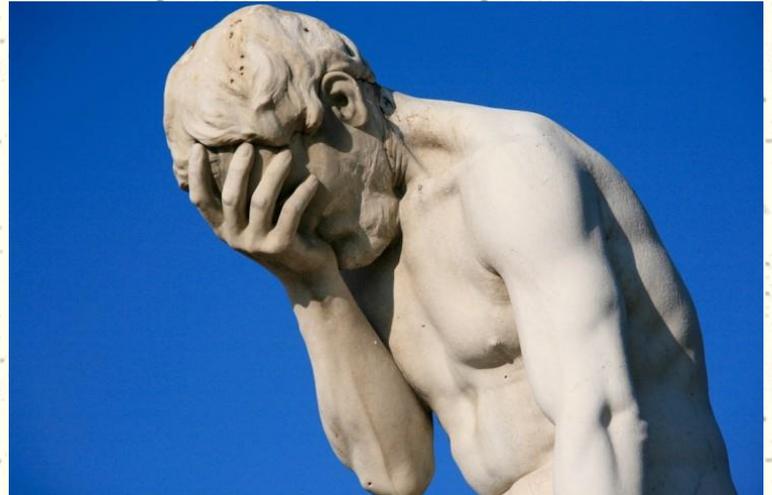
Shaming and Blaming

Smoking and alcohol addiction may have their origin in environmental exposures early or late in life.

Shaming individuals who have developed an addiction is counterproductive in helping them to recover.

Blaming the individual reflects an attitude that the addict is herself morally culpable for what may be a genetic predisposition, early childhood exposures, or other factors.

Shaming and blaming the individual is not only inappropriate, it is counterproductive.



Redefining the meaning of privacy



Privacy is an inherent dignity interest because human beings are subject to all types of potential discrimination

Privacy as a Dignity Interest

- # Respect for persons requires protection of individual rights to keep medical information private
 - The availability of private information may lead to adverse social and economic consequences
- # Revelation of epigenetic information can reveal behavioral patterns which do not necessarily affect one's employability or insurability

Legal shortcomings

- # GINA: Legal protections for genetic information do not apply to epigenetic information
 - Section 101(d)(6)(A) of GINA defines genetic information with respect to any individual as “(i) such individual’s genetic tests; (ii) the genetic tests of family members of such individual [section 101(d)(5)(B) defines “family member” to include up to fourth-degree relatives]; and (iii) the manifestation of a disease or disorder in family members of such individual.”
 - Section 101(d)(7)(A) defines a “genetic test” as “an analysis of human DNA, RNA, chromosomes, proteins or metabolites that detects genotypes, mutations, or chromosomal

Legal challenges

Americans with Disabilities Act

- The ADA applies only to impairments that constitute a “substantial limitation of a major life activity,” and therefore it applies only to conditions that already have a substantial manifestation
- This gap in coverage between GINA and the ADA leaves individuals with epigenetic markers of disease without legal protection from discrimination

Legal allowances



- # The Affordable Care Act encourages wellness programs
 - EEOC: an employer may offer an inducement of up to 30% of the total health plan for information about the spouse's manifestation of disease or disorder as part of a health risk assessment (HRA) administered in connection with an employer-sponsored wellness program.

Legal omissions

HIPAA

- does not protect research data (OCR, 2002)
 - # may always use or disclose for research purposes health information which has been de-identified
- does not protect employee wellness programs that are not part of a health plan
- but epigenetic data in these and other databanks can be reconstituted for purposes of identification (Philibert, Terry, & Erwin, 2014)

No expectation of privacy

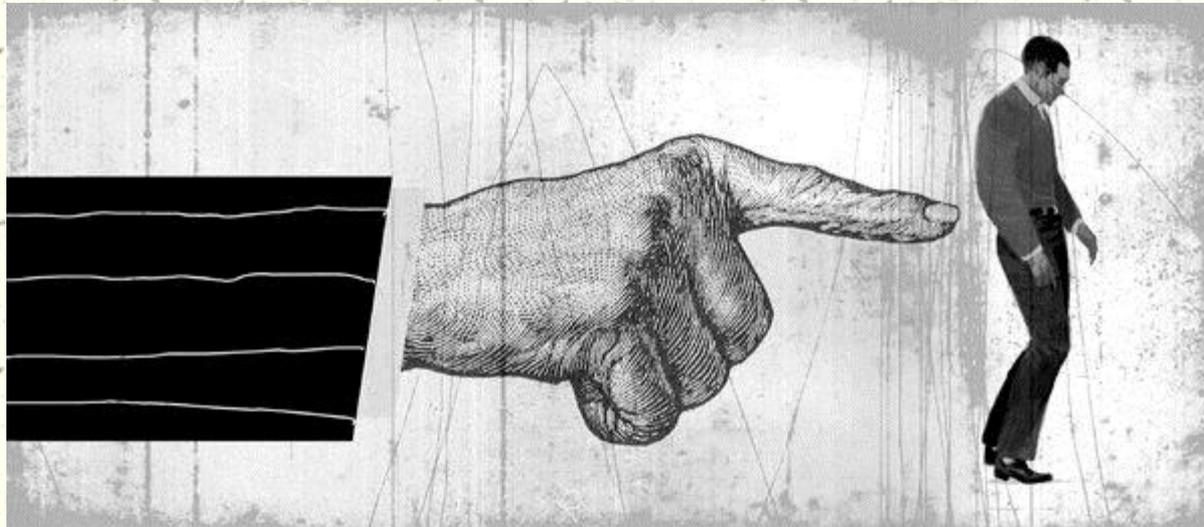
- # Research participants must rely on the ethical integrity of the researcher
- # Employment and wellness programs are positioned to “nudge” employees to get tested

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The nucleotide sequence of the 799 base pair CpG island that regulates serotonin transporter transcription.

Autonomy and Nudging

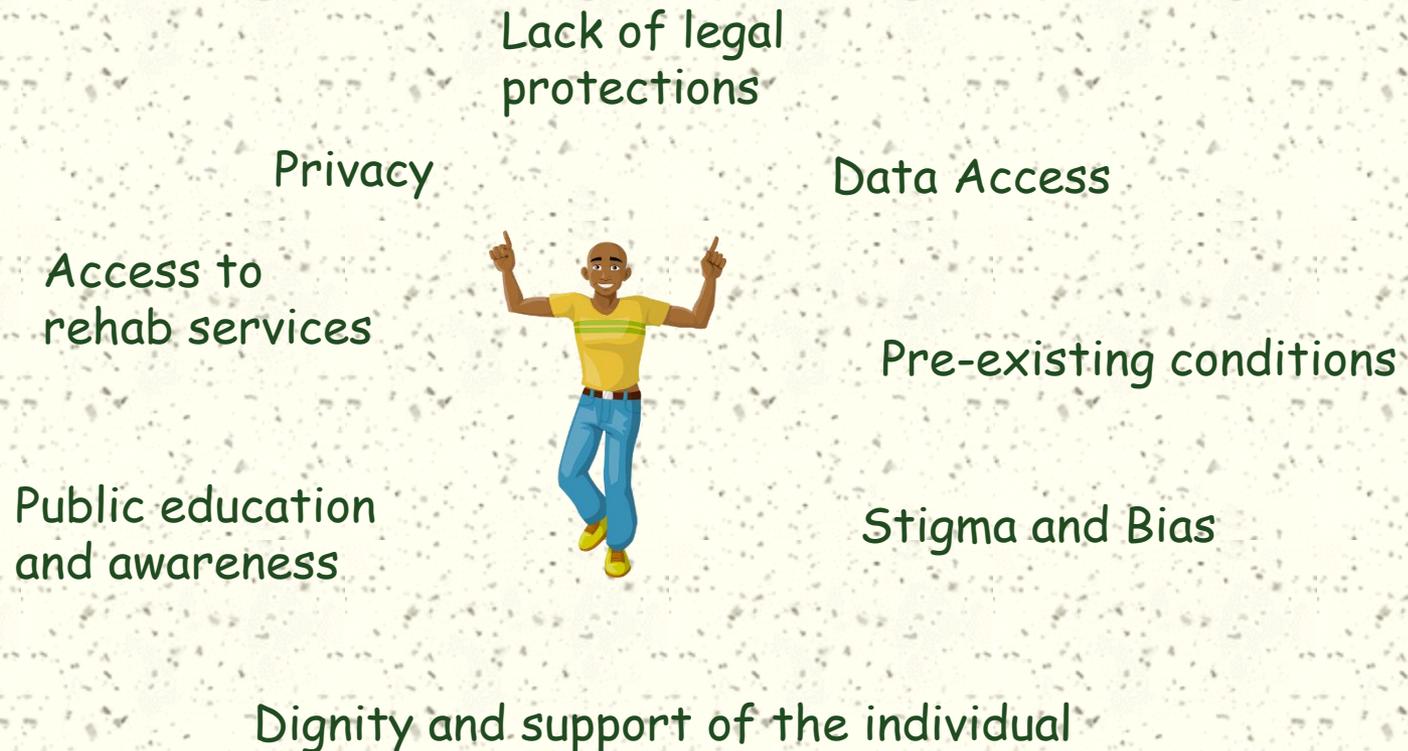
- # Sunstein and Thaler, in their 2008 book *Nudge* described the central paradox of liberal democracy: There is no such thing as common sense. Sunstein and Thaler explain how choices we believe are freely made are, instead, the result of “choice engineering” for good or bad purposes.



Good nudging and bad nudging

- # The term “coercion” can mean any number of things including threats, the offer of reward, “interpersonal leverage”, and even “persuasion”
- # There is a large variation exists between individuals susceptibility to inducement, and among the circumstances of those individuals
- # A nudge becomes bad when it is neither transparent nor in the best interests of the person being nudged (Thaler, NYTimes, 2015)

Ethical Challenges of Neuro-epigenetics



Data access

- # Used in the right way, with informed consent and adequate privacy protections, these technologies will lead to better health outcomes and prevention of long-term addictions. Without respect for the autonomy of each person, no matter their health status, these technologies have the potential to do more harm than good
 - CAAGGGCCTCTAAGCTGAGCTCACATCCCAGCCGGTCAGTCAGATAAACGCATGGGTATCGAGTAC TGCTAGGTCCCAGGAAGAAAGAGTTGATCAGCTTTCGAT **CHERYLERWIN**CCGGAGAGGTCAAGA GAAAGCCGGCACGAGCAGACCCCTGTGTGCCGTCCGCCCTGCCCTGCAAGEGTACAATACGACAGC CAGCGCCGECGGGTGCCTCGAGGGCGCGAGGCCAGCCCGCCTGCCAGCCCGCGGACCAGCCTCCC CGCGCAGCCGTGGCAGGTGTGGGTCCGCTTTTCTCTCCGCCTCGAACCCACGTTTCTTTCCAGACCT TCTTCCCCGCCTCGGGGAGGGGGATAGAACGCTGCGCCCCACCGCCCTGCG

Access to Treatment

- # It does not help to identify individuals who are using alcohol, tobacco, or cannabis if no options are available to help them overcome these patterns of behavior.
- # In studies of genetic discrimination, participants reveal one of the reasons they choose not to know the status of a deleterious genetic trait like Huntington's disease is the lack of access to any ameliorative treatment options.
- # Similarly, for those without access to substance use treatment, the lack of assistance in overcoming addiction may shift the choice landscape from hopeful to overwhelming despair.

Impacts on health insurance

- # Substance use disorders in the United States alone add more than \$44 billion annually to the costs of healthcare.
- # The Affordable Care Act requires coverage of substance use disorders treatment and insurers may not charge higher premiums for individuals with a substance use disorder.
- # Current proposals could change or eliminate this coverage, resulting in fewer options for individuals identified as using alcohol, tobacco, or cannabis.
- # The potential loss of health insurance eligibility, or increased costs, could result in significant harm to individuals nudged into these tests

Ethical obligations in the absence of regulatory oversight

Minimize risk and maximize benefit

- Epigenetic testing has the potential to identify individuals who may benefit from early intervention in the addiction process.
- However, rather than equalizing the playing field, coercion towards uptake of epigenetic technologies has the potential to further reinforce the social and economic inequalities that lie behind many poor health outcomes.

- # Commit to individualized decision making because without respect for the autonomy of each person, no matter their health status, these technologies have the potential to do more harm than good.

Ethical obligations

Privacy and Confidentiality

- Researchers and testing facilities must make a commitment to protect the privacy and confidentiality of epigenetic data
- The commitment must go beyond the current legal requirements: Do not trade privacy for security
 - Example: Apple has resisted even government requests and requires business associates (apps) to adhere to privacy standards
- Remain open to future concerns raised by ethicists and the public

Ethical obligations

Informed consent

- Must be truly informed and non-coerced
- Potential future forensic uses, such as the use of epigenetic information in crime scene investigations or identification of relatives should be explicitly stated or, better, disavowed
- Risks disclosed should include psychosocial harms and economic impacts

Ethical obligations



- # Avoid conflicts of interest
 - Disclose, disclose, disclose
 - Maintain transparency about the ethical challenges facing epigenetic testing
 - Make a public commitment to the protection of subjects, patients, and communities

Ethical obligations

Protect vulnerable communities

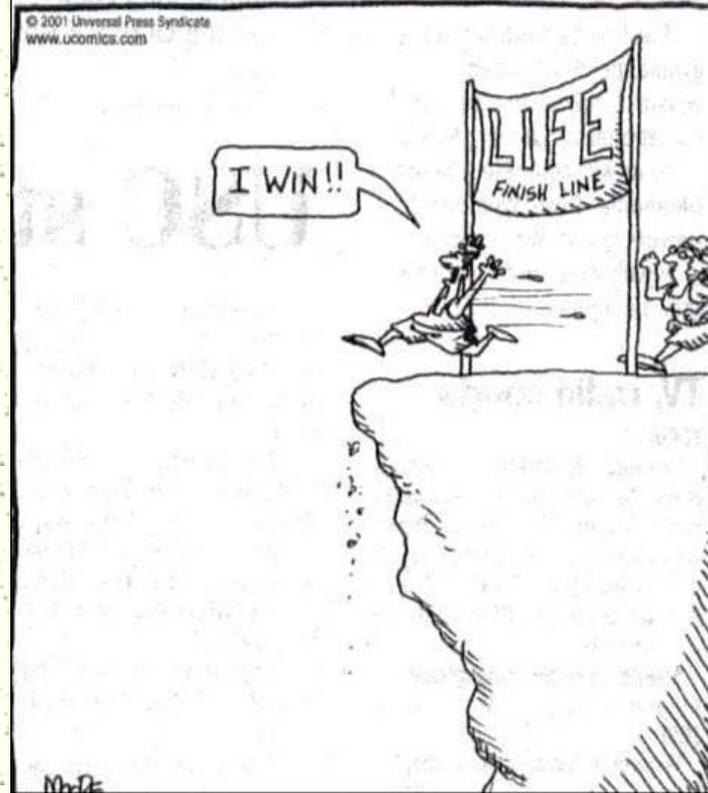
- Especially the community of mental health patients
- Educate the public about the interplay between genes the environment and targeted interventions
- Social justice requires a focus on early and appropriate interventions to mitigate environmental exposures and prevent substance use disorders
- Work to promote access to rehabilitation services where needed

Ethical obligations

- # Ongoing ethics review of data programs
 - Make everyone aware of privacy risks and needed legal protections
 - Review policies to protect data sharing and data access
 - Release the minimum necessary information always
 - Where patent thickets prevent adequate dissemination of health technologies focus on shared value

In the Bleachers

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Conclusion

- # Epigenetic explanations of disease should not provide exculpation for the addicted, but they provide an opportunity to explain how we got here, and they can provide insights towards prevention and recovery.
- # Concerns about the risks of early identification of substance use must be balanced against the potential benefits, the individual's autonomy and dignity interests, and the availability of services to treat those identified as in need of help.



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