

Medical Family History: Tools For Your Practice

National Coalition for Health Professional
Education in Genetics

National Society of Genetic Counselors

Learning Objectives

After viewing this presentation, one should be able to:

- List three benefits of taking family history in medical practice
- Create a pedigree using standard symbols
- Identify five genetic red flags
- Know how to locate family history tools
- Know how to locate a genetics professional
- Use the core competencies to interpret family histories in case examples

Why Family History?

- **Single-gene disorders:**

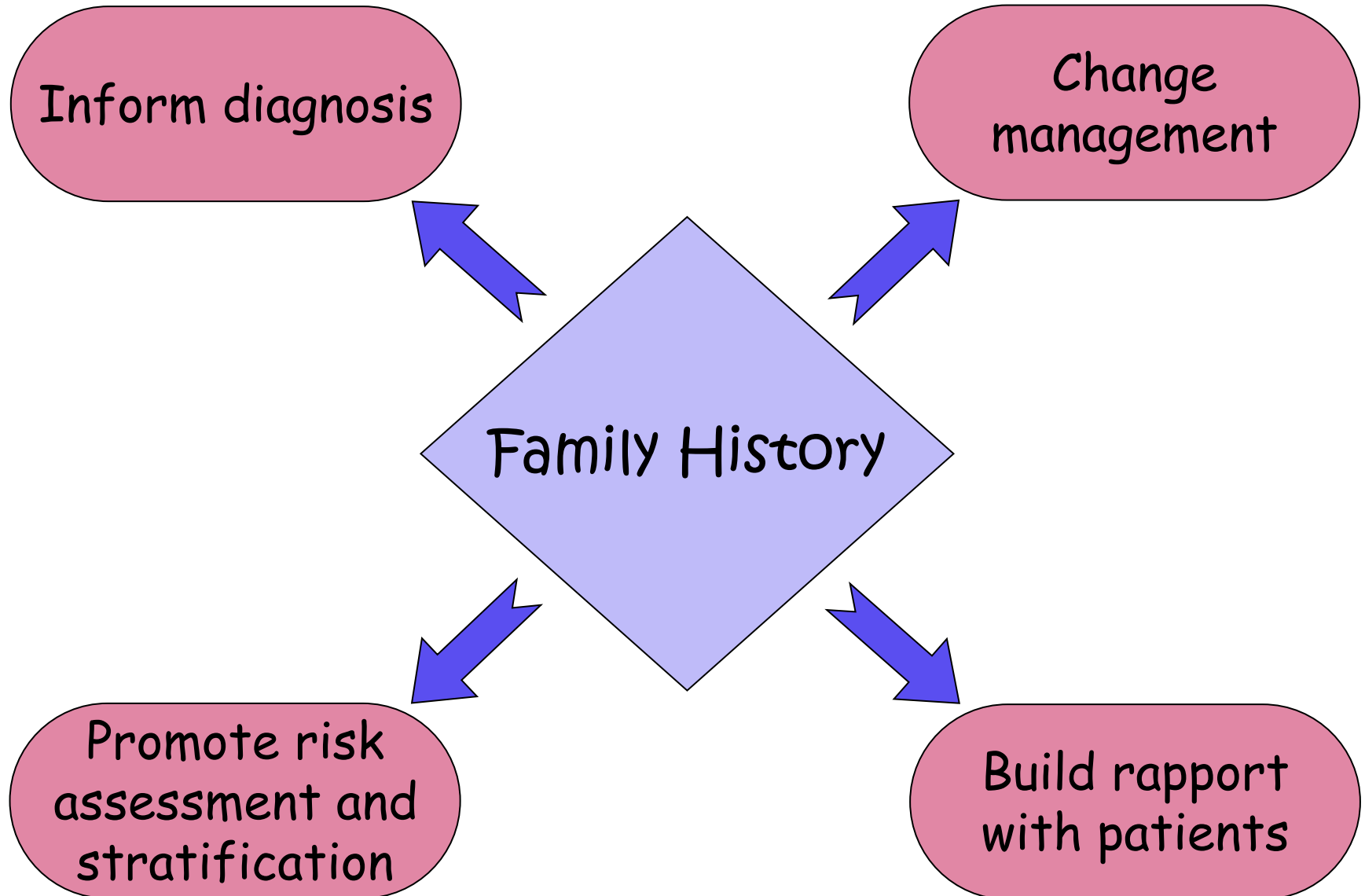
Knowledge of family history can aid in the diagnosis and treatment of rare single-gene disorders such as cystic fibrosis, fragile X syndrome, Huntington disease, or familial hypercholesterolemia.

- **Common, complex diseases:**

Family history has been shown to be a major risk factor for many chronic diseases such as cardiovascular disease, cancer, mental illness, and asthma.

⇒ Family history may be the primary risk factor!

Why Family History?



Prioritizing Information

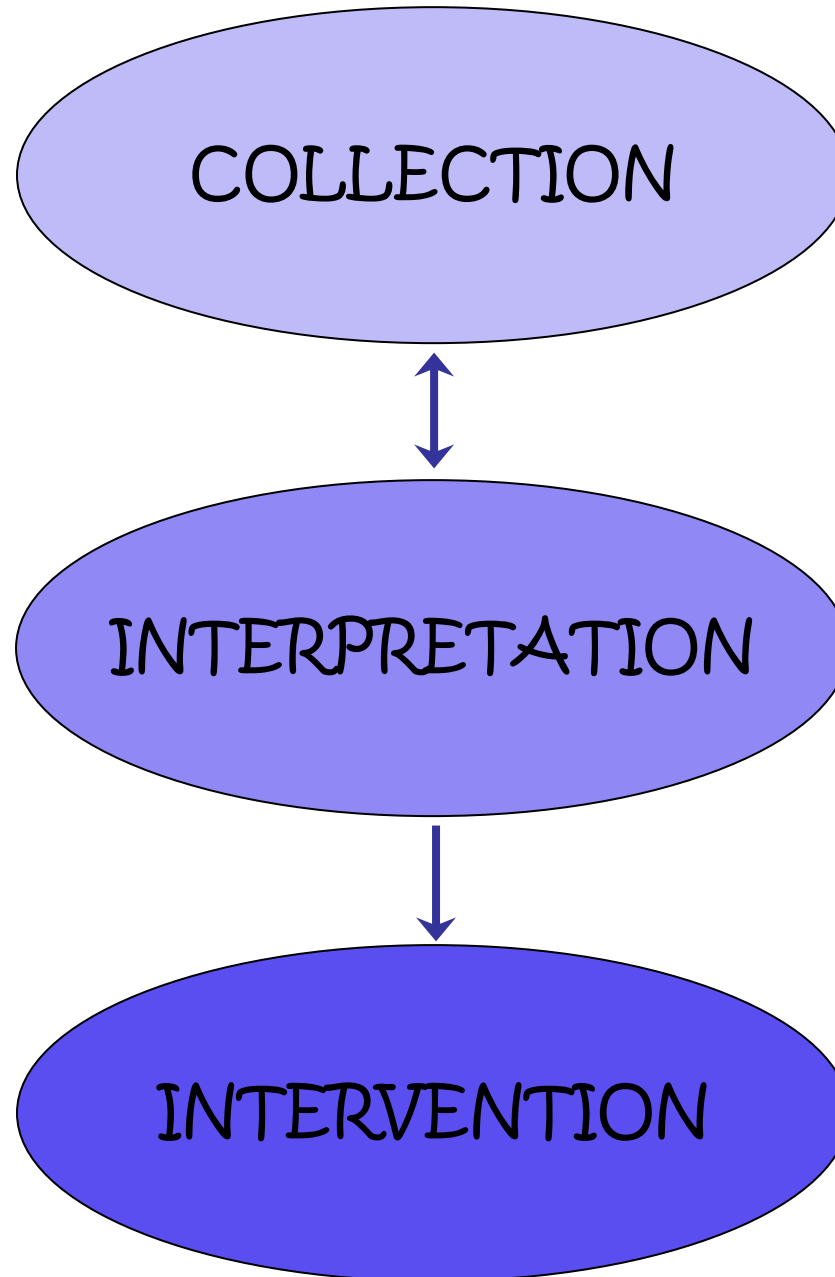
Comprehensive vs. targeted family history

Comprehensive

- General healthcare setting
- Elicit general health information about relatives
 - 1) Major medical concerns
 - 2) Chronic medical conditions
 - 3) Hospitalizations, surgeries
 - 4) Birth defects
 - 5) Mental retardation, learning disabilities, developmental delay

Targeted









































- Specialized clinical setting or evaluation for specific concerns
- Specific information about the condition of concern


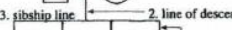

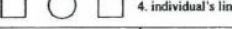
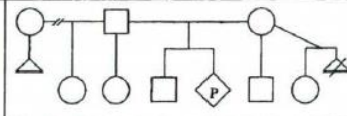










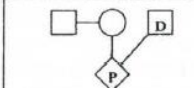


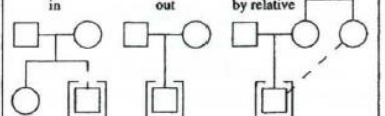


Collection

1) Recognize, understand, and use standard pedigree symbols

Pedigree Symbols

	Male	Female	Sex Unkown
Individual (assign gender by phenotype)	 b. 1925	 30	 4 mo
Clinically affected individual (define shading in key/legend)			
Affected individual (> one condition)			
Multiple individuals, number known			
Multiple individuals, number unknown			
Deceased individual	 d. 35 y	 d. 4 mo	
Stillbirth (SB)	 SB 28 wk	 SB 30 wk	 SB 34 wk
Pregnancy (P)	 LMP: 7/1/94	 20 wk	 16 wk
Spontaneous abortion (SAB), ectopic (ECT)	 male	 female	 ECT
Affected SAB	 male	 female	 16 wk
Termination of pregnancy (TOP)	 male	 female	 12 wk
Affected TOP	 male	 female	 12 wk
Consultand	 b. 4/24/59	 35y	
Proband	 P	 P	

Definitions	Comments						
<p>1. relationship line</p>  <p>2. line of descent</p>  <p>3. sibship line</p>  <p>4. individual's lines</p> 	<p>If possible, male partner should be to left of female partner on relationship line.</p> <p>Siblings should be listed from left to right in birth order (oldest to youngest)</p> <p>For pregnancies not carried to term (SABs and TOPs), the individual's line is shortened.</p>						
Relationships	 <p>A break in a relationship line indicates the relationship no longer exists. Multiple previous partners do not need to be shown if they do not affect genetic assessment.</p>						
Consanguinity	 <p>If degree of relationship not obvious from pedigree, it should be stated (e.g., third cousins) above relationship line.</p>						
Twins	<table border="1"> <thead> <tr> <th>Monozygotic</th> <th>Dizygotic</th> <th>Unknown</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Monozygotic	Dizygotic	Unknown			
Monozygotic	Dizygotic	Unknown					
							
Sperm donor (D)							
No children by choice or reason unknown							
Infertility							
Adoption							

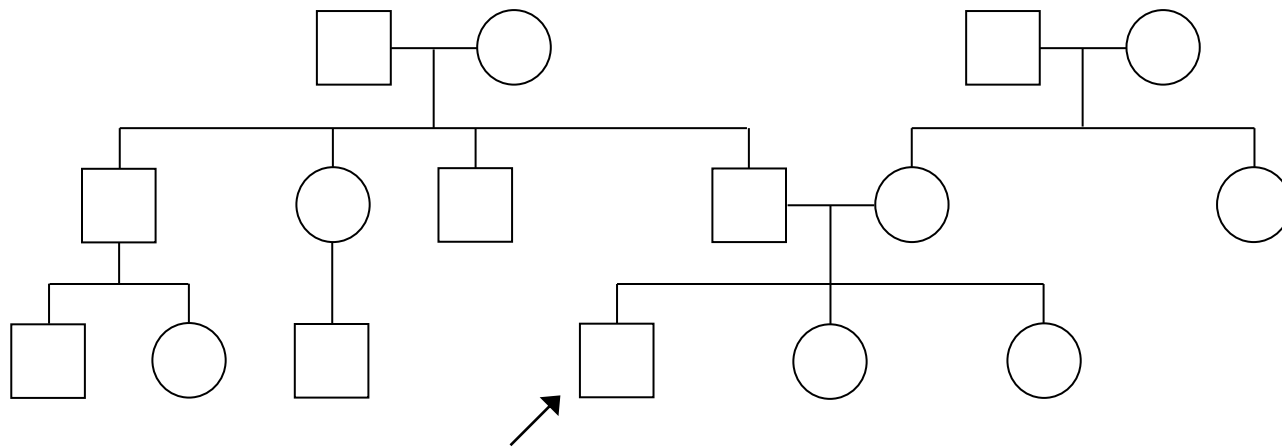
Bennett, et al. (1995). Recommendations for standardized human pedigree nomenclature. *Am J Hum Genet*, 56(3), 745-52.

Collection

2) Produce at least a three-generation pedigree that includes:

- Identification of the patient

Identify the patient, or **consultand**, with an arrow

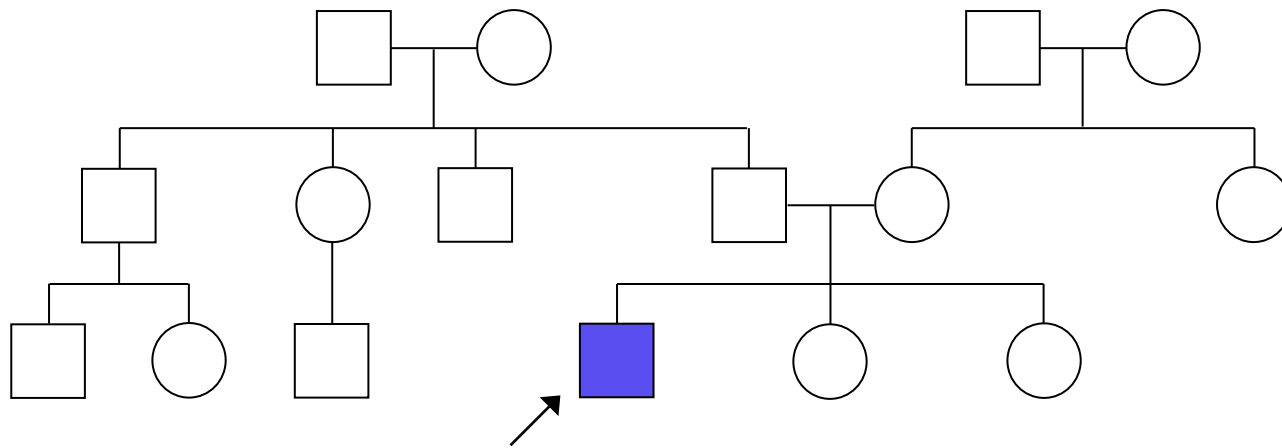


Collection

- Identification of the **proband**:

The **proband** is the affected individual who brings the family to medical attention

(A **consultand** is often also a **proband**)



Collection

2) Produce at least a three-generation pedigree that includes:

- Patient's first-, second-, and third-degree relatives
- Information on maternal and paternal relatives
- Representation of “full” from “half” relationships
example: children with same or different partner
- Affected and unaffected relatives

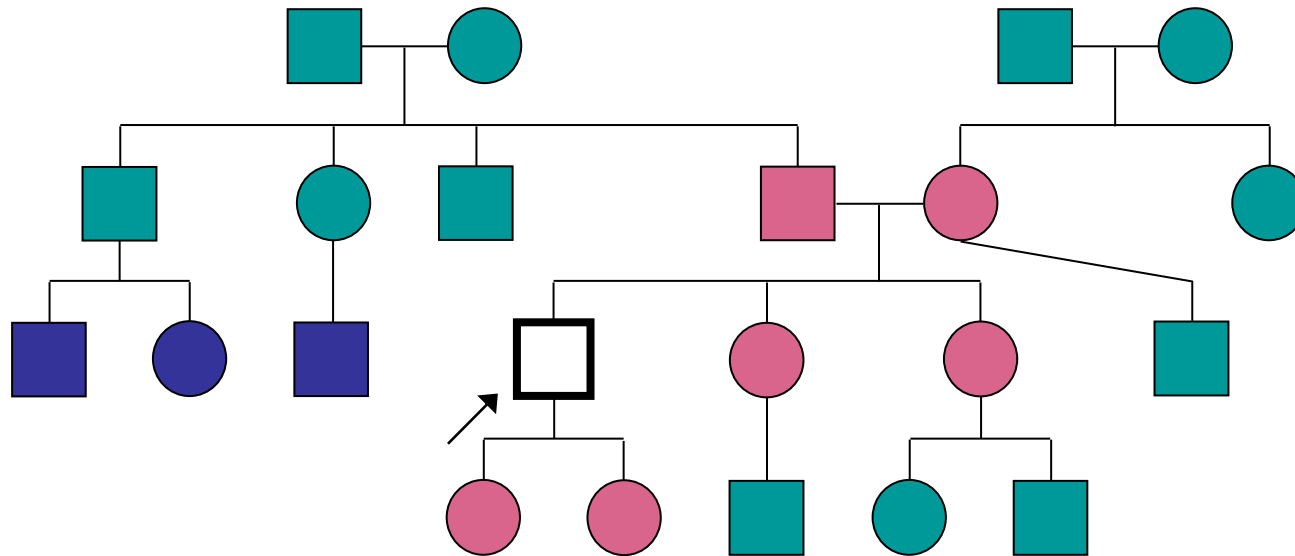
Collection

2) Produce at least a three-generation pedigree that includes:

- Identification of the historian, or person providing the information
 - May be the patient or someone else, such as a parent
- Date of collection (or date of update), and name of collector (or updater)
- Legend or key, if symbols are used to designate disease

Collection

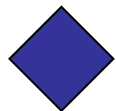
Degrees of Relationship



First-degree relatives: parents, siblings, children



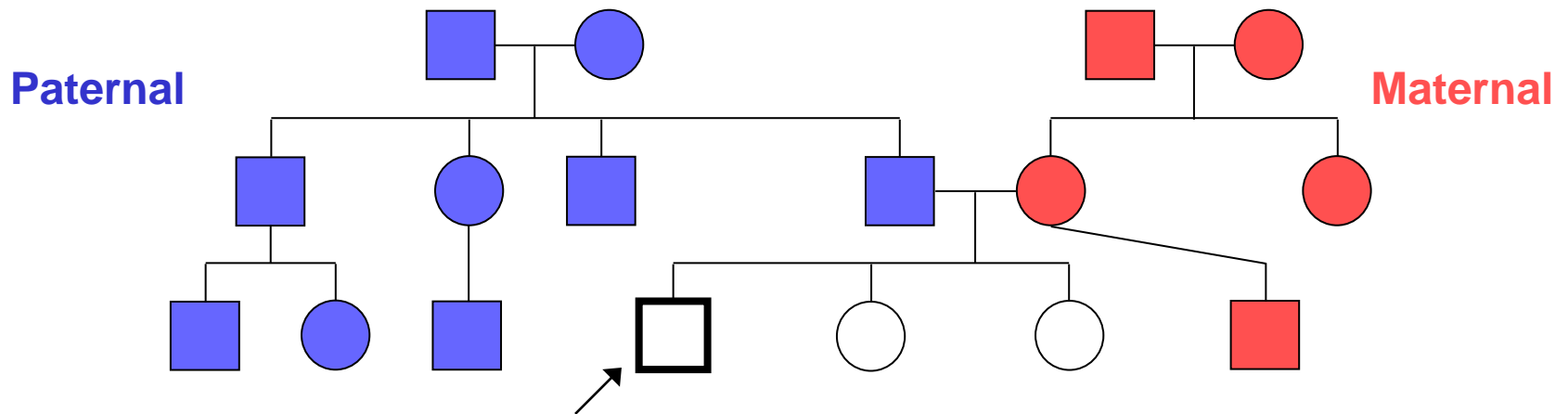
Second-degree relatives: half-siblings, aunts, uncles, grandparents, nieces & nephews



Third-degree relatives: first cousins

Collection

Maternal and paternal relatives



Collection

3) Elicit the following information for individuals represented in pedigree as required for clinical indications:

- Age, birth date, or year of birth
- Relevant health information
- Diagnosis, age at diagnosis
- Age at death, or years of birth/death
- Cause of death
- Ethnic background for each biological grandparent

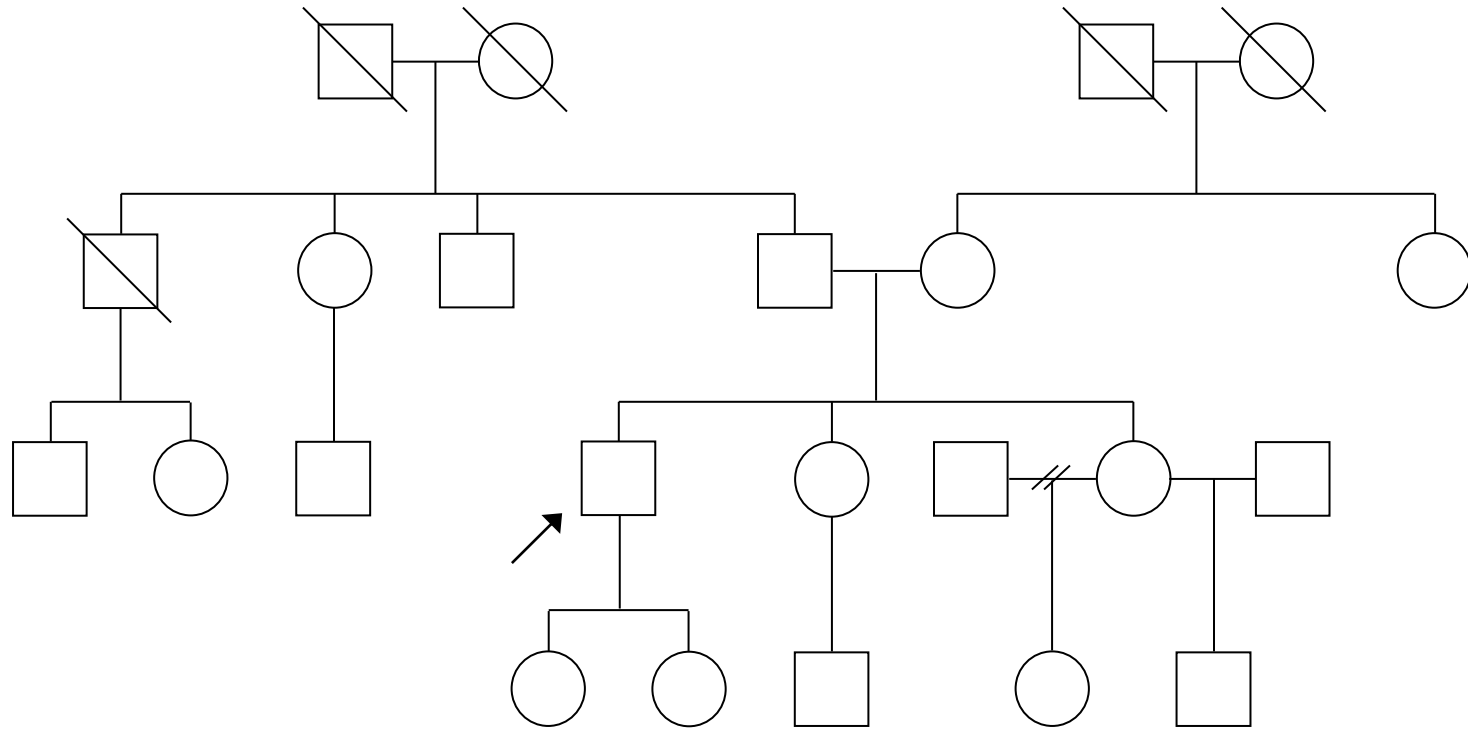
Collection

3) Elicit the following information for individuals represented in pedigree as required for clinical indications:

- Infertility, or no children by choice
- Consanguinity
- Pregnancies
- Pregnancy complications (note gestational age)
 - Miscarriages
 - Stillbirths
 - Ectopic pregnancies
 - Pregnancy terminations
 - Preterm birth
 - Preeclampsia
 - Bleeding/clotting complications

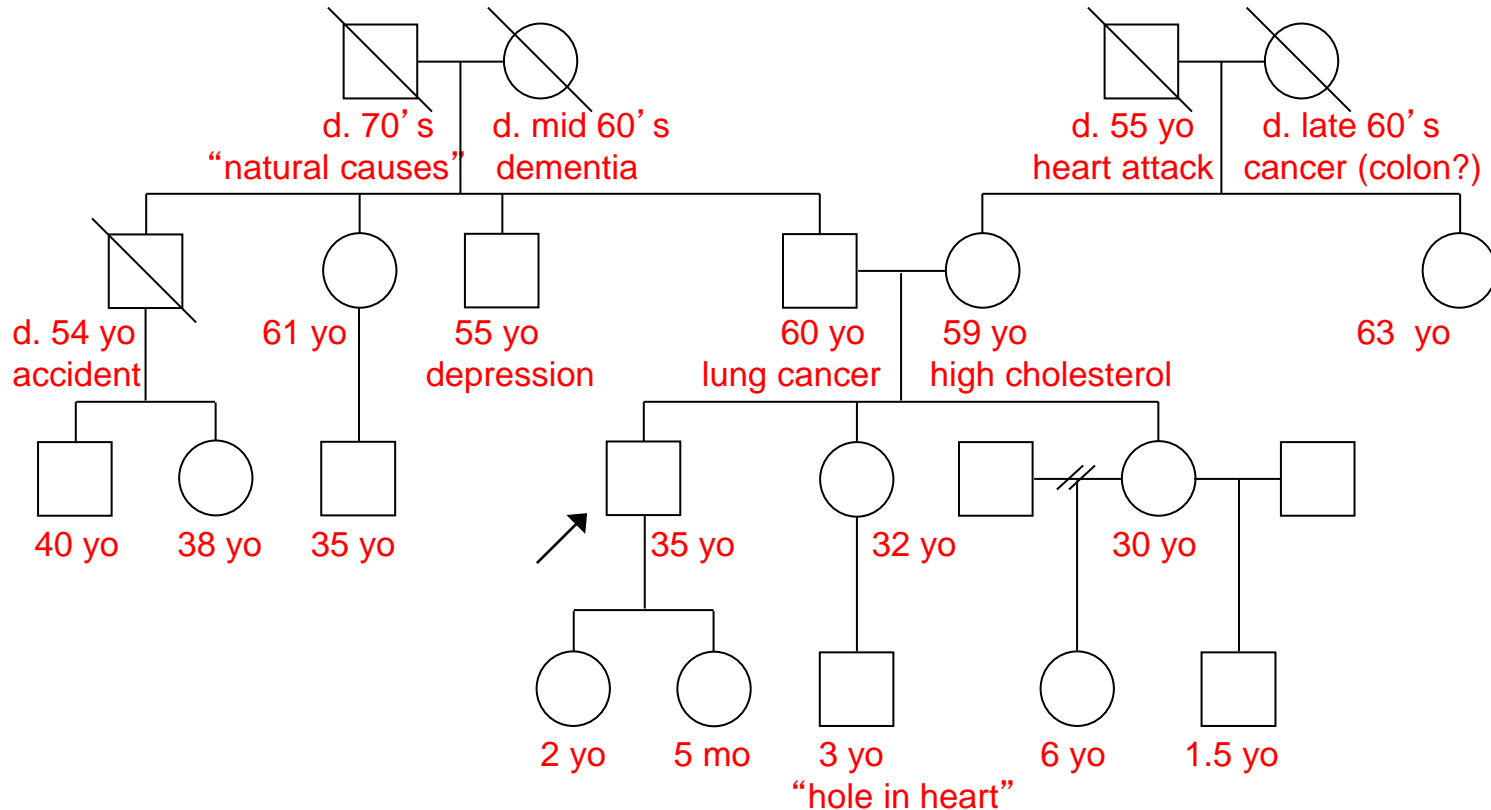
Collection

- Identification of patient
- Patient's first-, second-, and third-degree relatives
- Information on maternal and paternal relatives



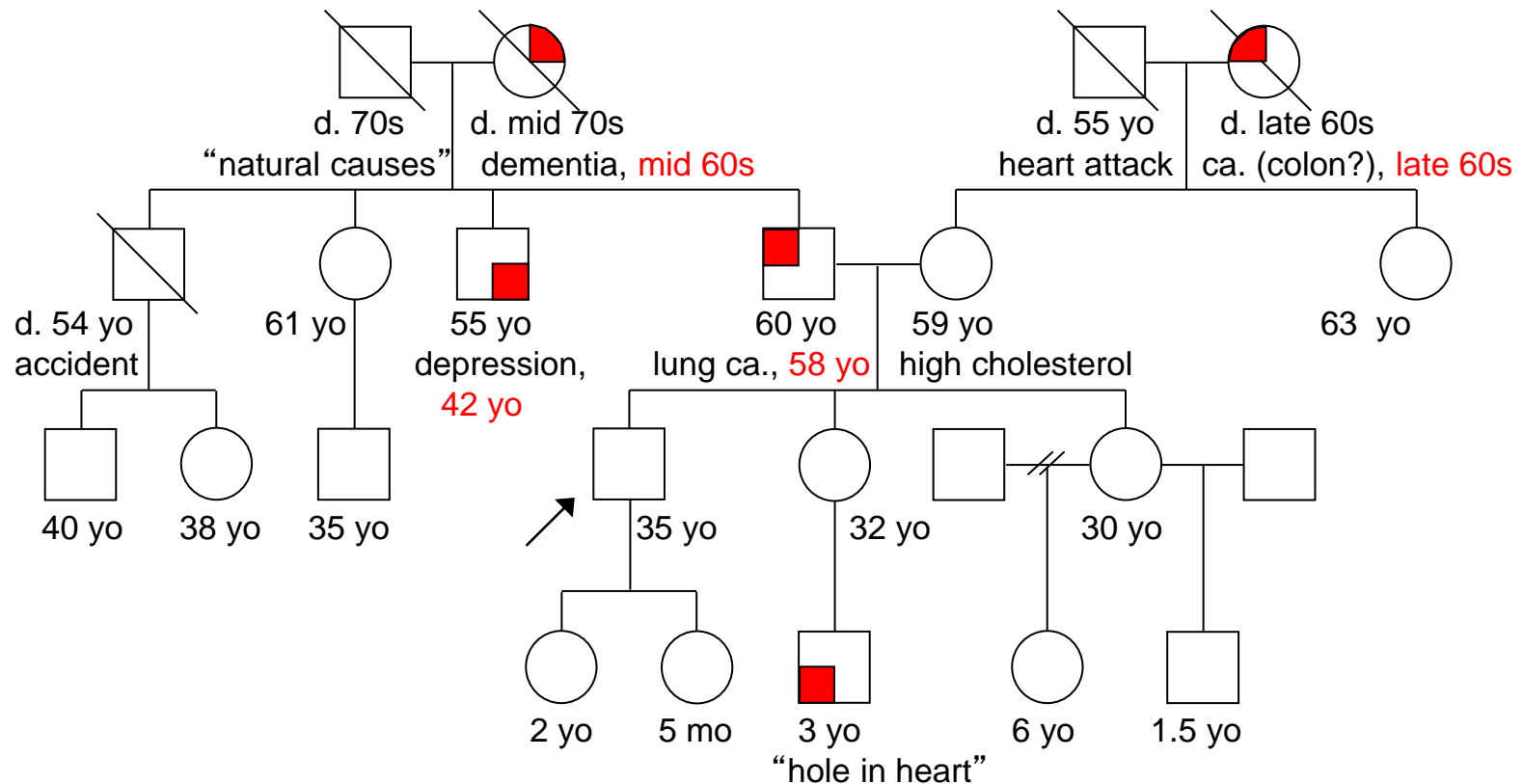
Collection

- Degree of relationship
 - Distinguish “full” from “half” relationships
- Age, birth date, or year of birth
- Age at, or year of death
- Relevant health information
- Cause of death



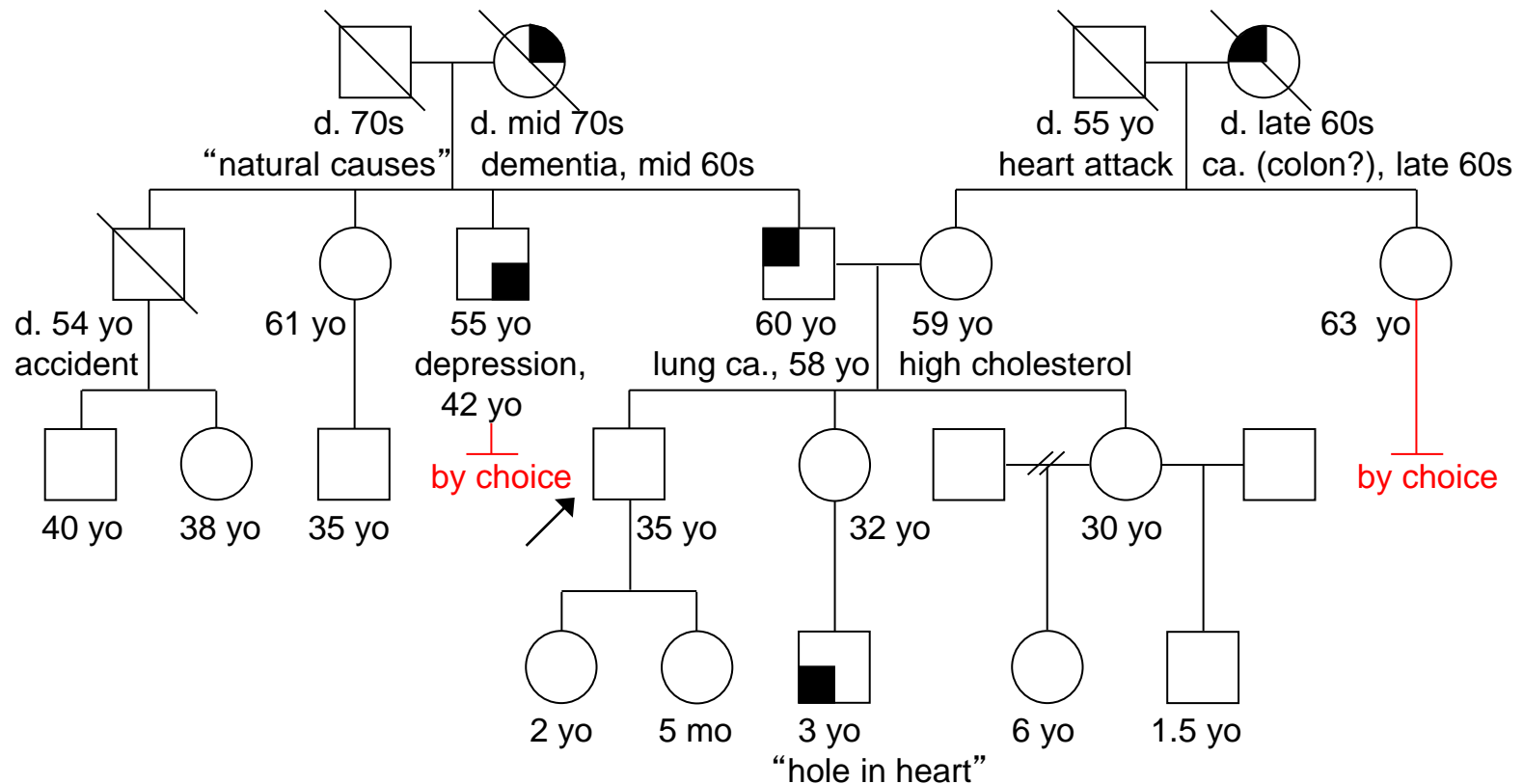
Collection

- Diagnosis, age at diagnosis
- Affected and unaffected individuals



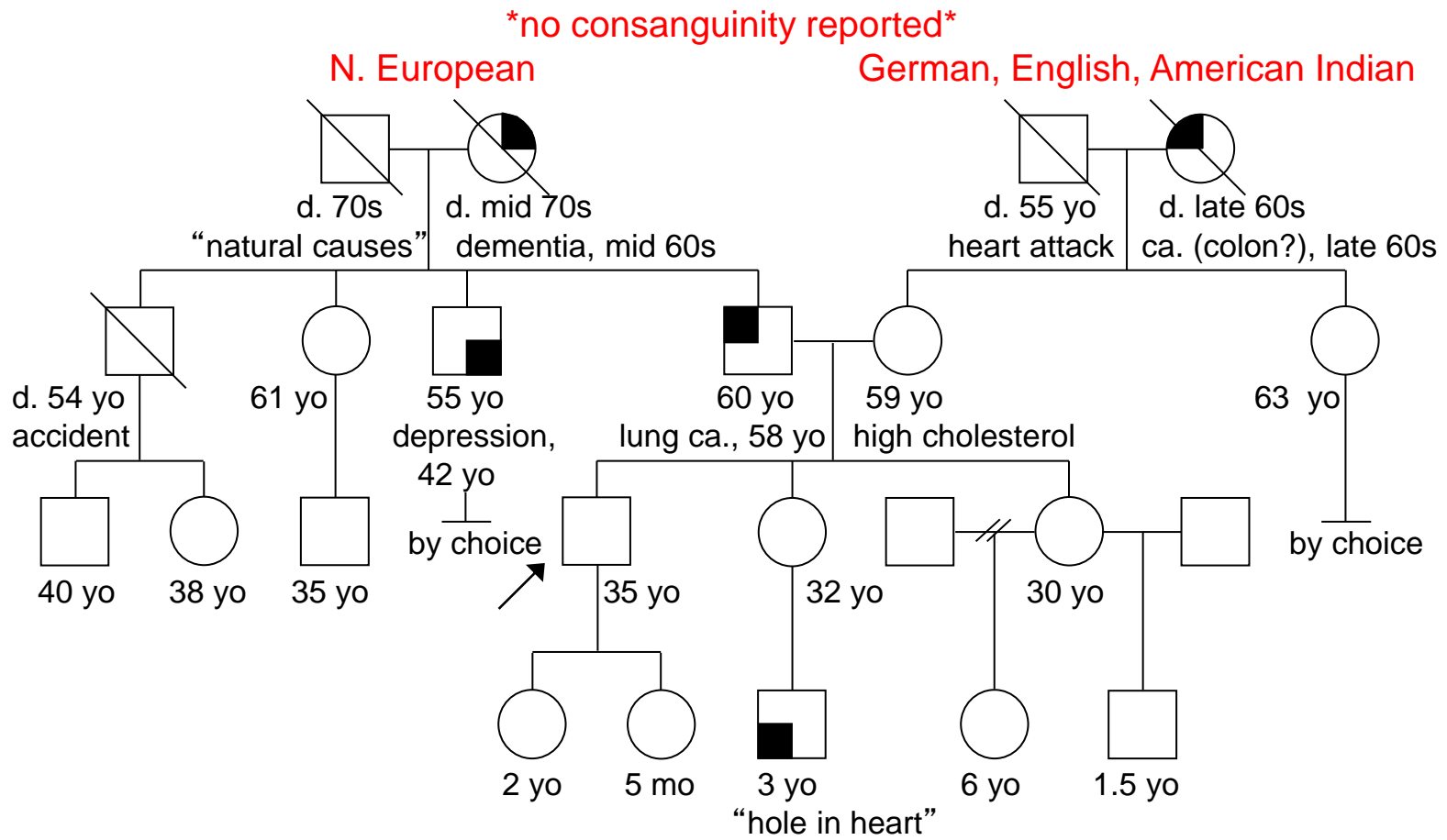
Collection

- Pregnancies
- Pregnancy complications (note gestational age)
- Infertility, or no children by choice



Collection

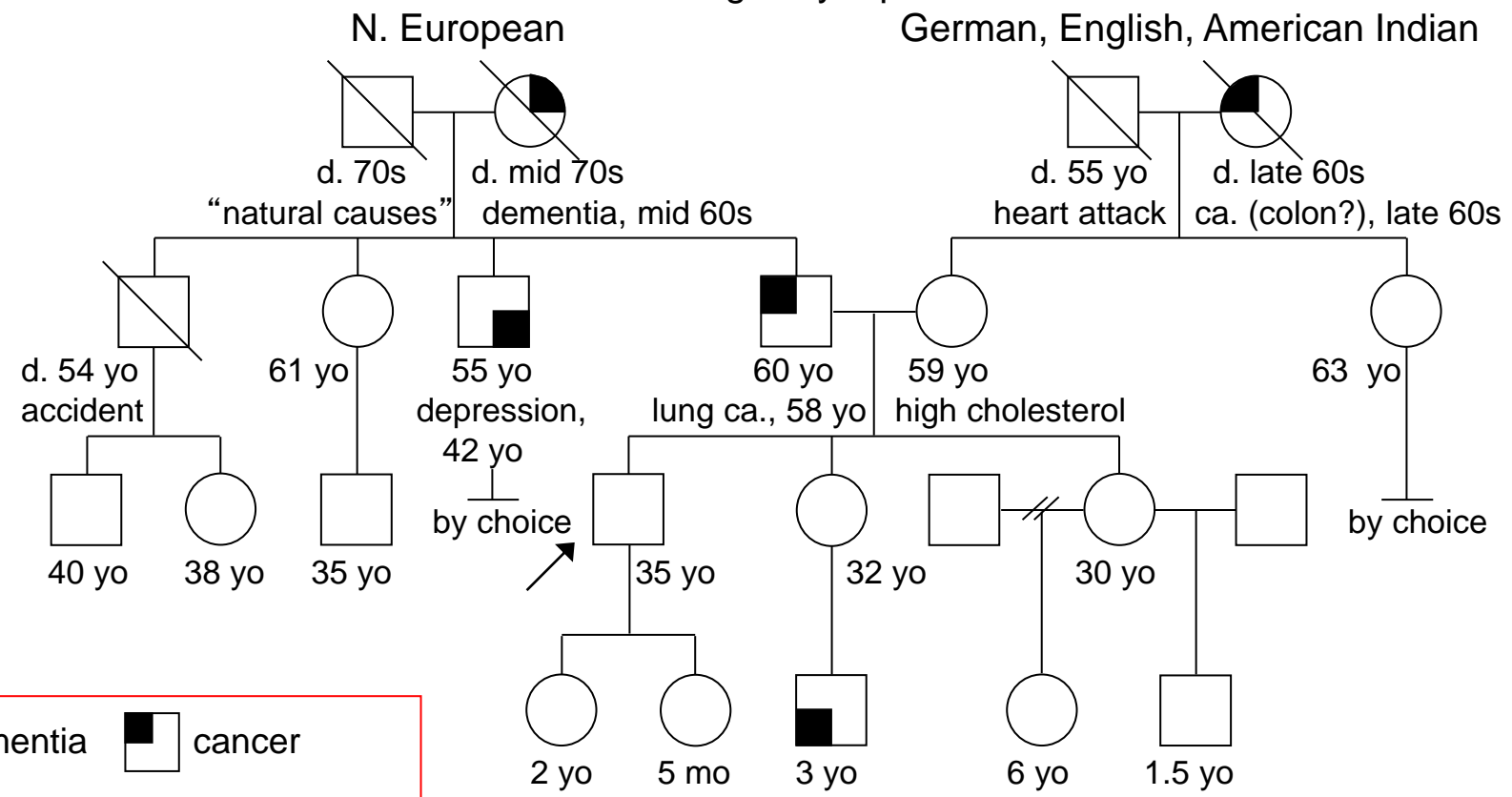
- Ancestral background for each biological grandparent
- Consanguinity



Collection

- Legend or key, if symbols are used to designate disease
- Date of collection (or update), name of collector (or updater)

no consanguinity reported

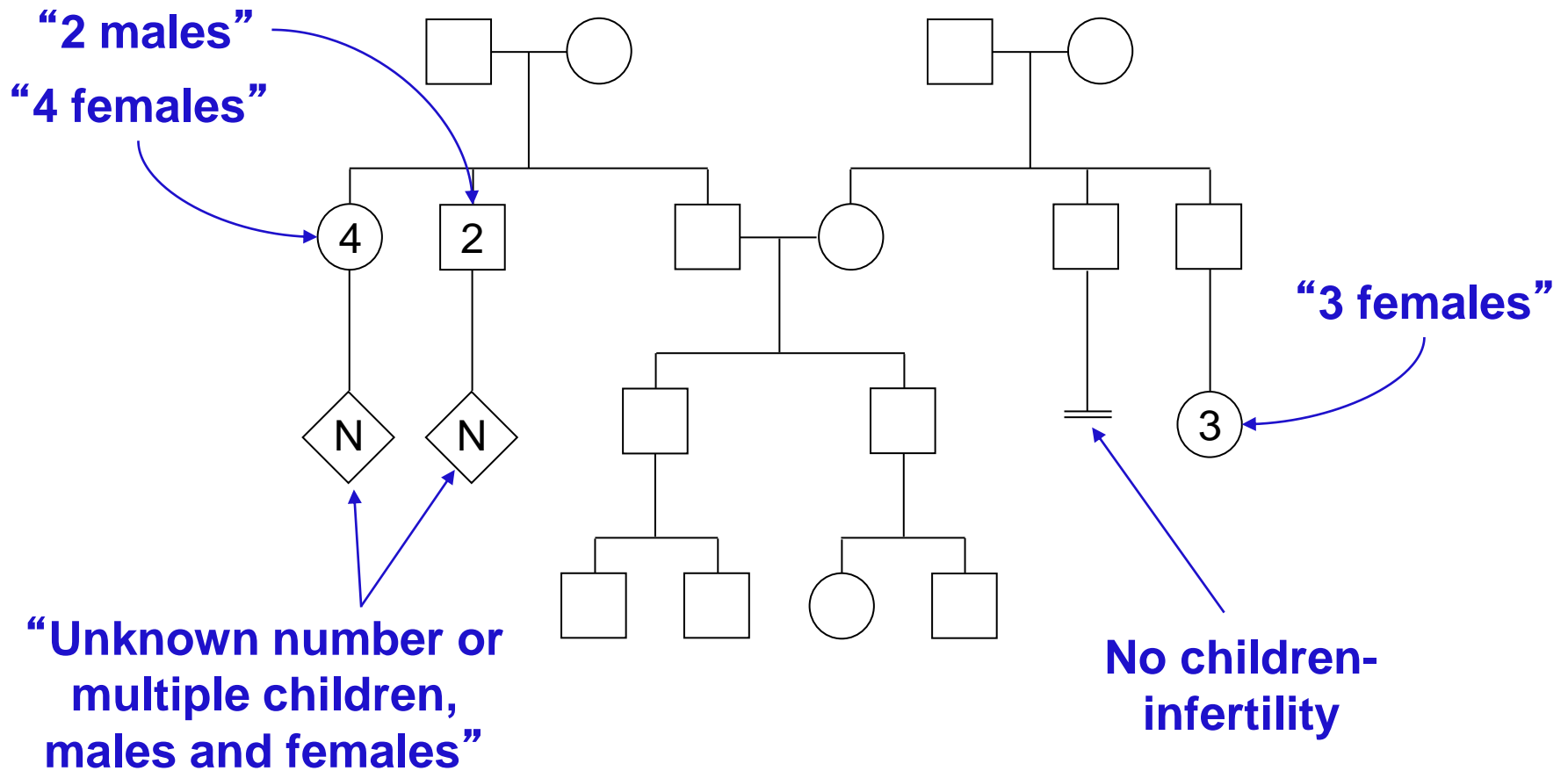


Key:

	dementia		cancer
	depression		born with "hole in heart"

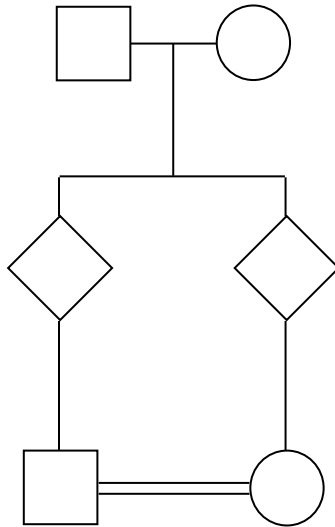
Collected by: Jane Doe
Collected on: August 20, 2006

Additional Standard Pedigree Symbols

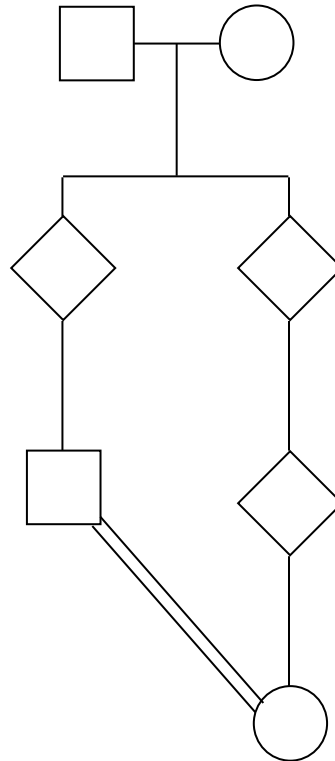


Consanguinity: Relationships

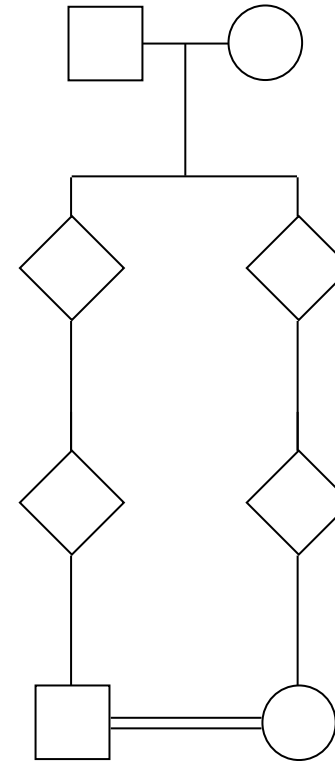
First cousins



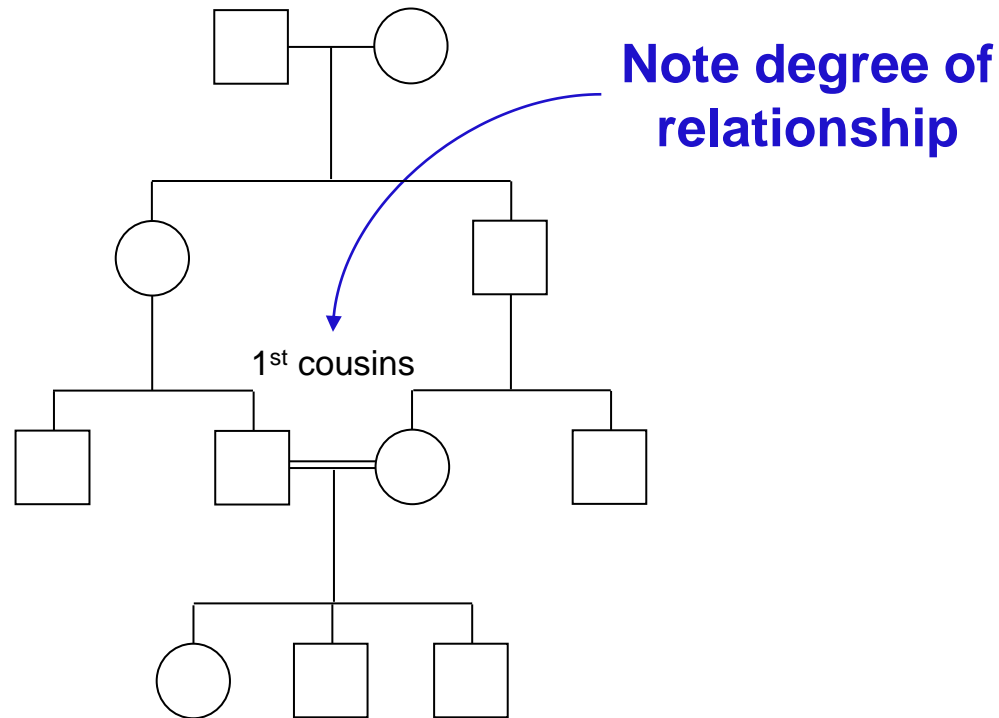
**First cousins
once removed**



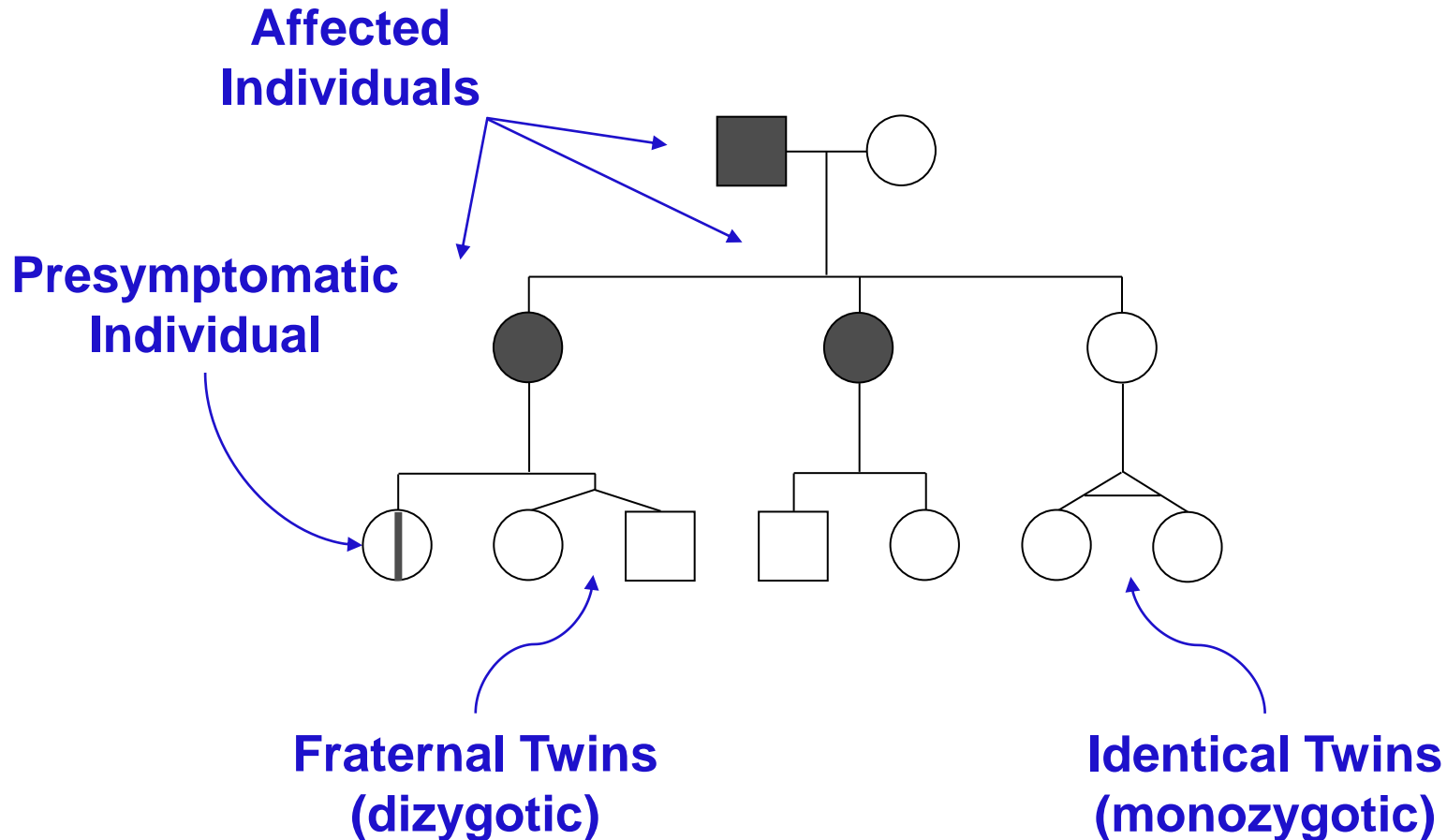
Second cousins



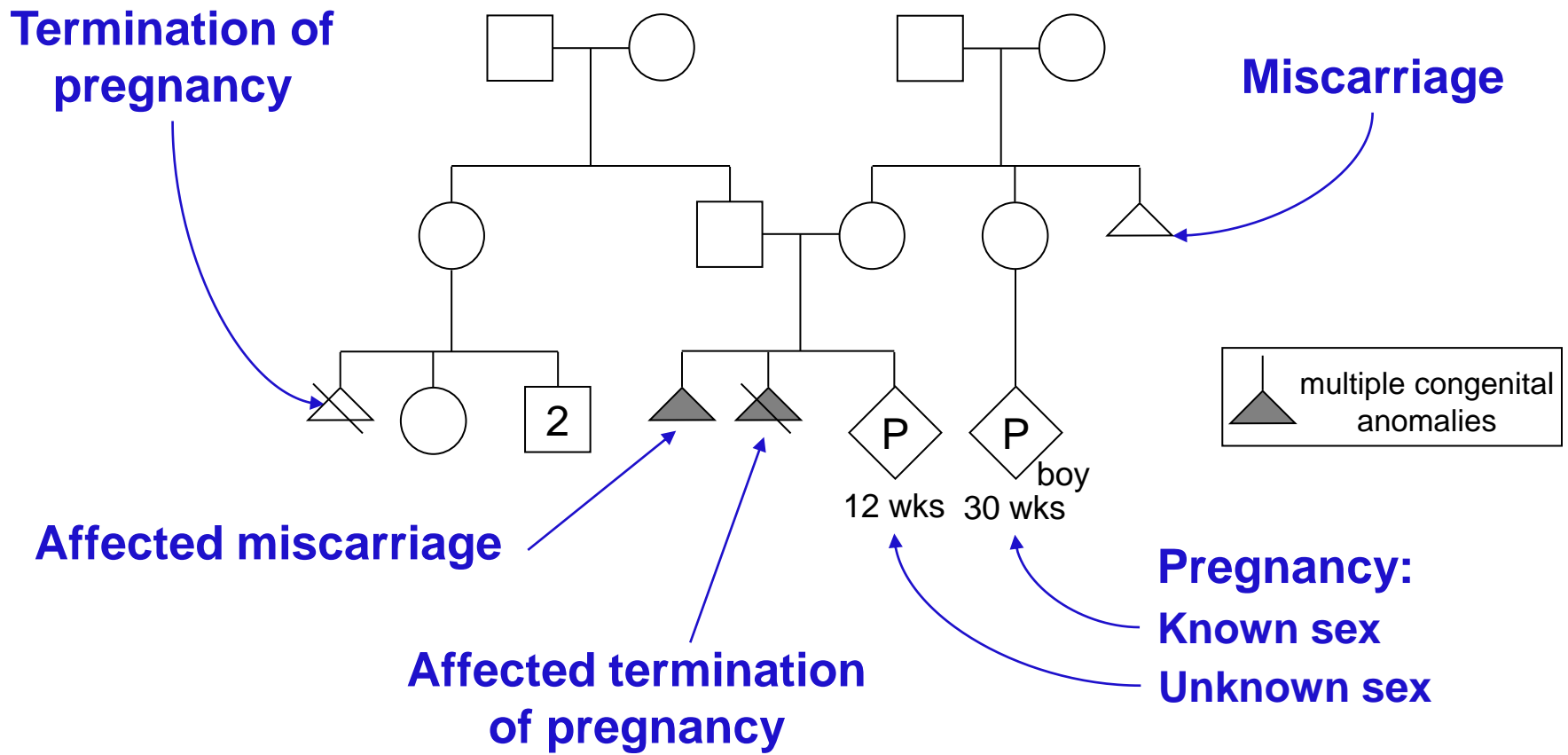
Consanguinity: An Example



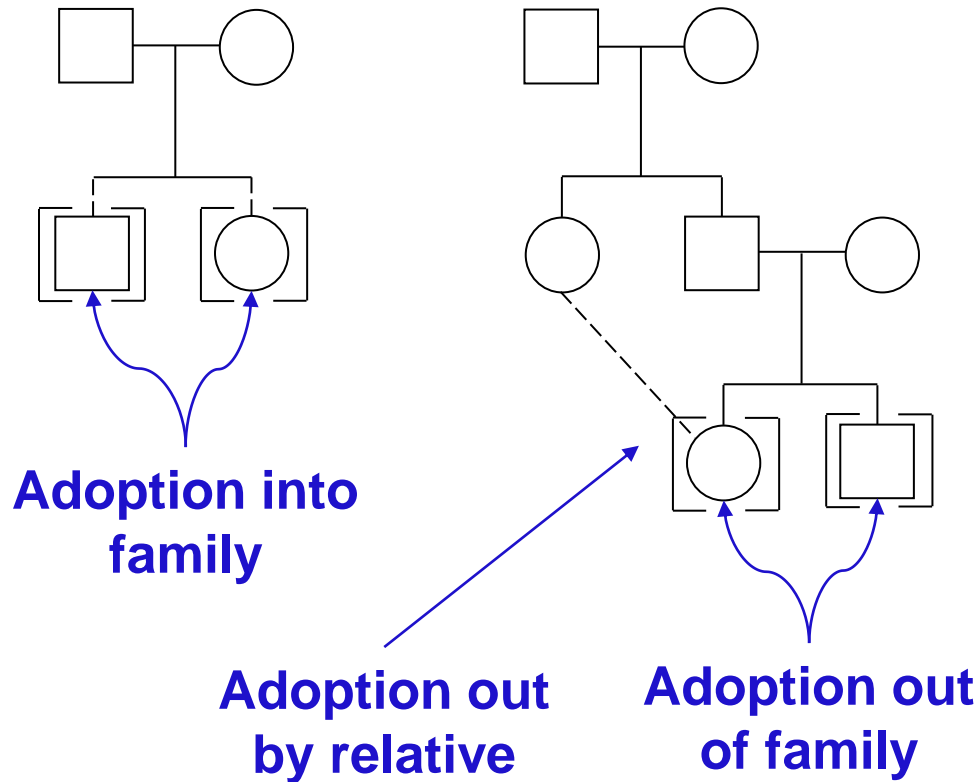
Additional Standard Pedigree Symbols



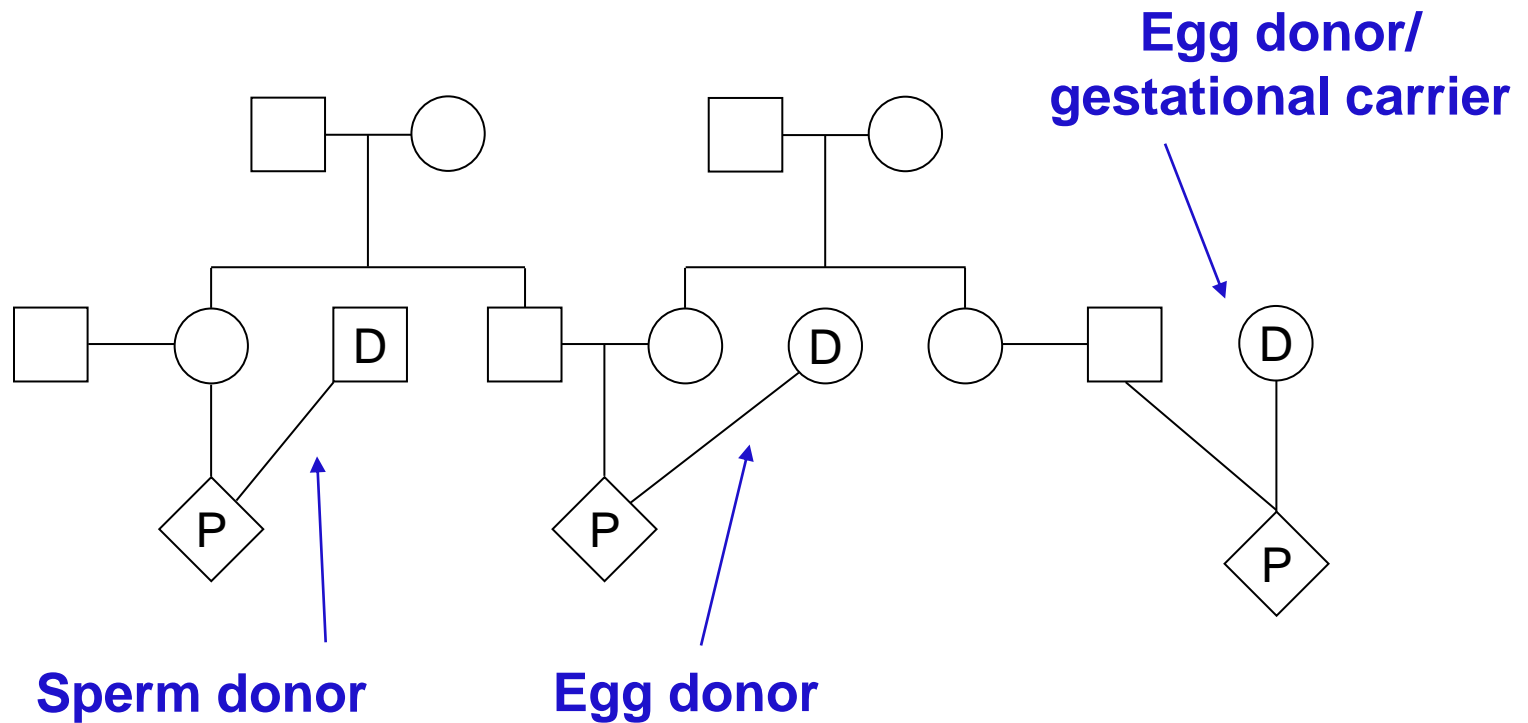
Additional Standard Pedigree Symbols



Additional Standard Pedigree Symbols



Additional Standard Pedigree Symbols



Interpretation

2) Recognize Genetic Red Flags:

Do you think a condition present in a family may be genetic? Look for these clues:

- 📖 Family history of known or suspected genetic condition
- 📖 Multiple affected family members with same or related disorders
- 📖 Earlier age at onset of disease than expected
- 📖 Developmental delays or mental retardation

Interpretation

2) Recognize Genetic Red Flags (cont.):

Do you think a condition present in a family may be genetic? Look for these clues:

- 🚩 Diagnosis in less-often-affected sex
- 🚩 Multifocal or bilateral occurrence in paired organs
- 🚩 One or more major malformations
- 🚩 Disease in the absence of risk factors or after preventive measures

Interpretation

2) Recognize Genetic Red Flags (cont.):

Do you think a condition present in a family may be genetic? Look for these clues:

- ⌘ Abnormalities in growth (growth retardation, asymmetric growth, excessive growth)
- ⌘ Recurrent pregnancy losses (2+)
- ⌘ Consanguinity (blood relationship of parents)
- ⌘ Ethnic predisposition to certain genetic disorders

Interpretation

Pedigrees

- Pedigree: uses standard symbols and terminology to represent a large amount of information in a diagram
- Preferred method of organizing and displaying family history
- Benefits:
 - 1) organize a great deal of information
 - 2) visualize inheritance patterns and familial clustering

Interpretation

1) Recognize basic inheritance patterns:

Multifactorial disorders

- Multiple genetic and environmental factors

Chromosomal disorders

- Extra/missing chromosomes
- Large-scale deletions or duplications
- Translocations

Single-gene disorders

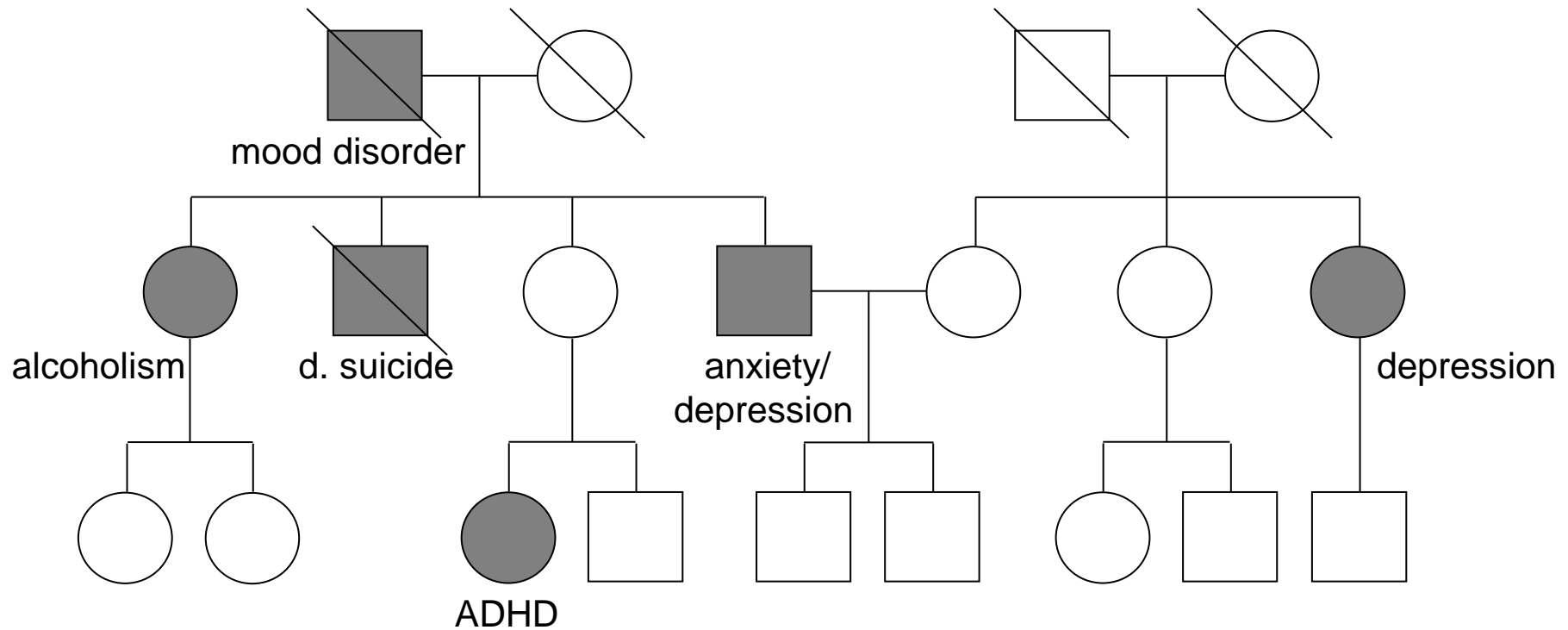
- Autosomal Dominant
- Autosomal Recessive
- X-Linked

Mitochondrial disorders

- Characterized by maternal transmission
- Usually neurological or neuromuscular symptoms

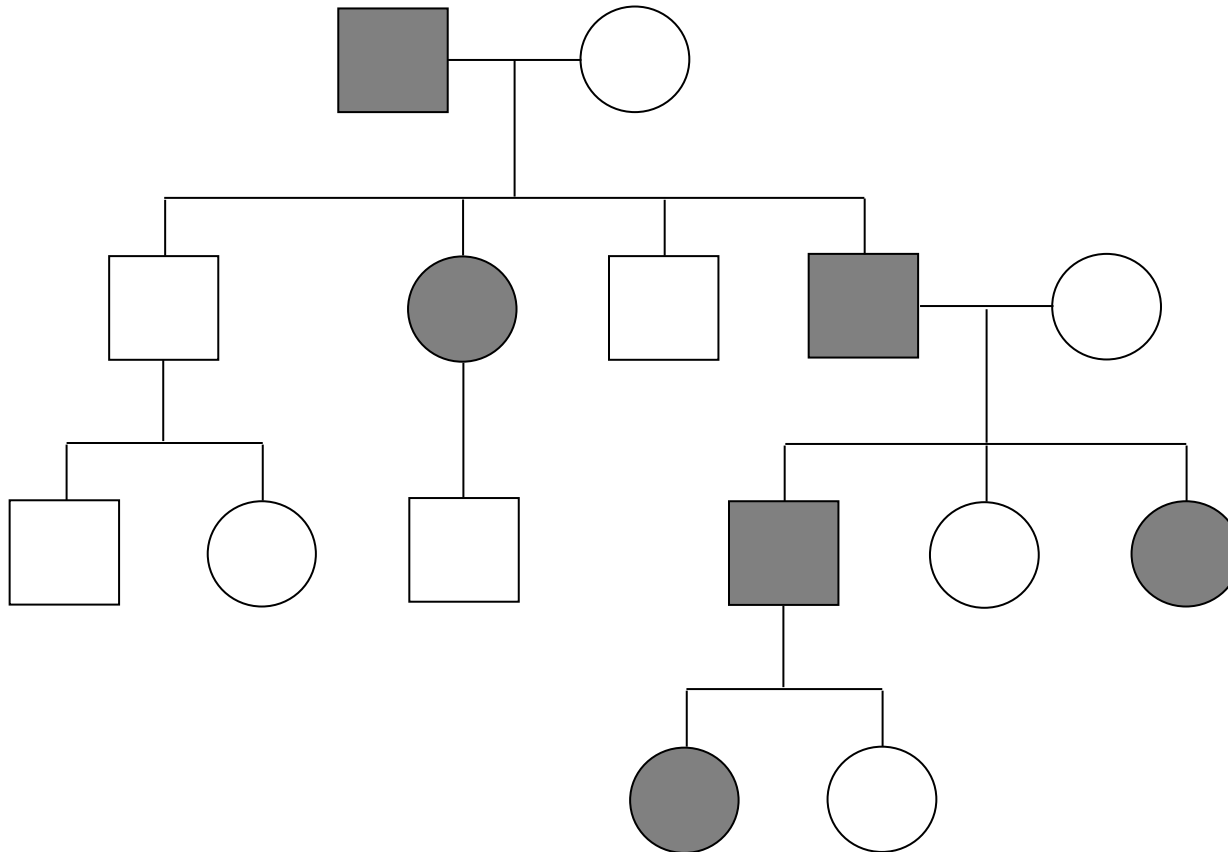
Multifactorial Inheritance

Familial Clustering



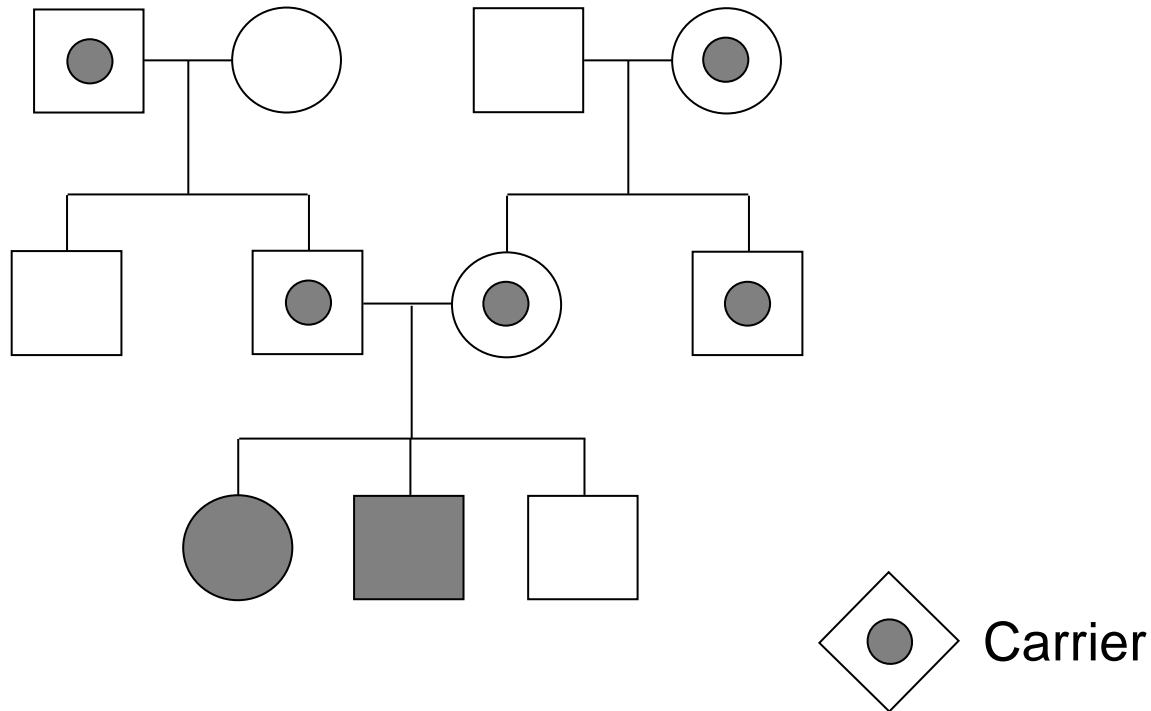
Single-gene Inheritance

Autosomal Dominant



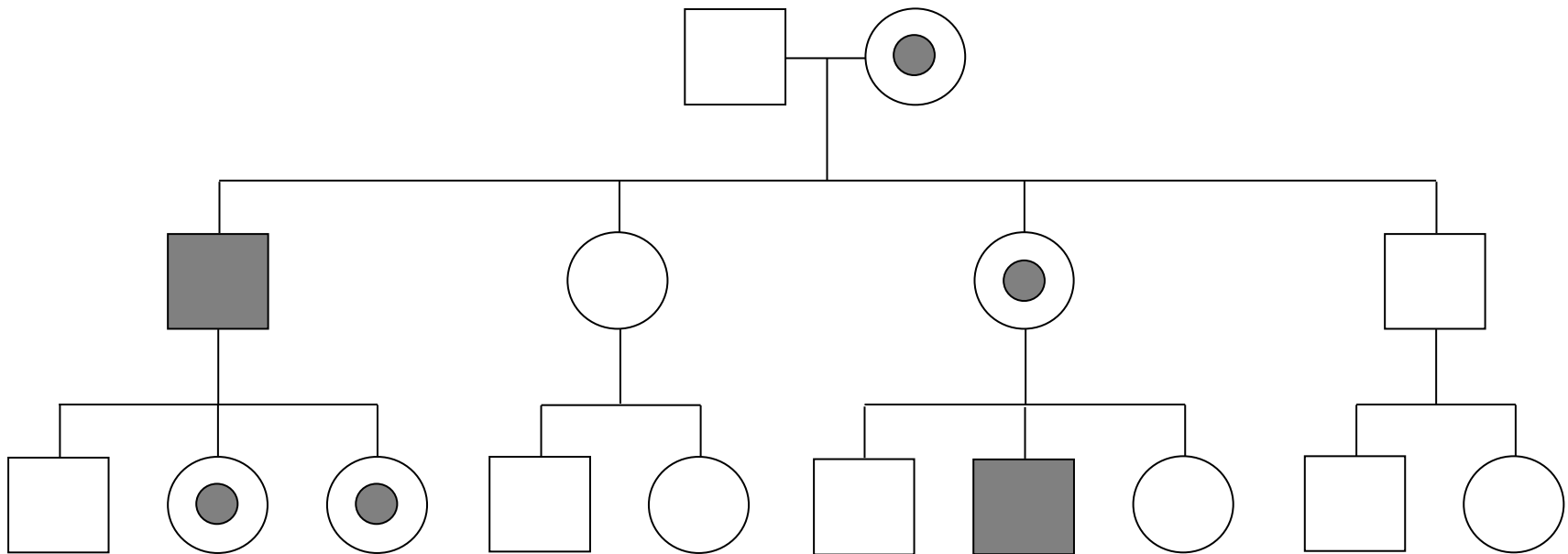
Single-gene Inheritance

Autosomal Recessive

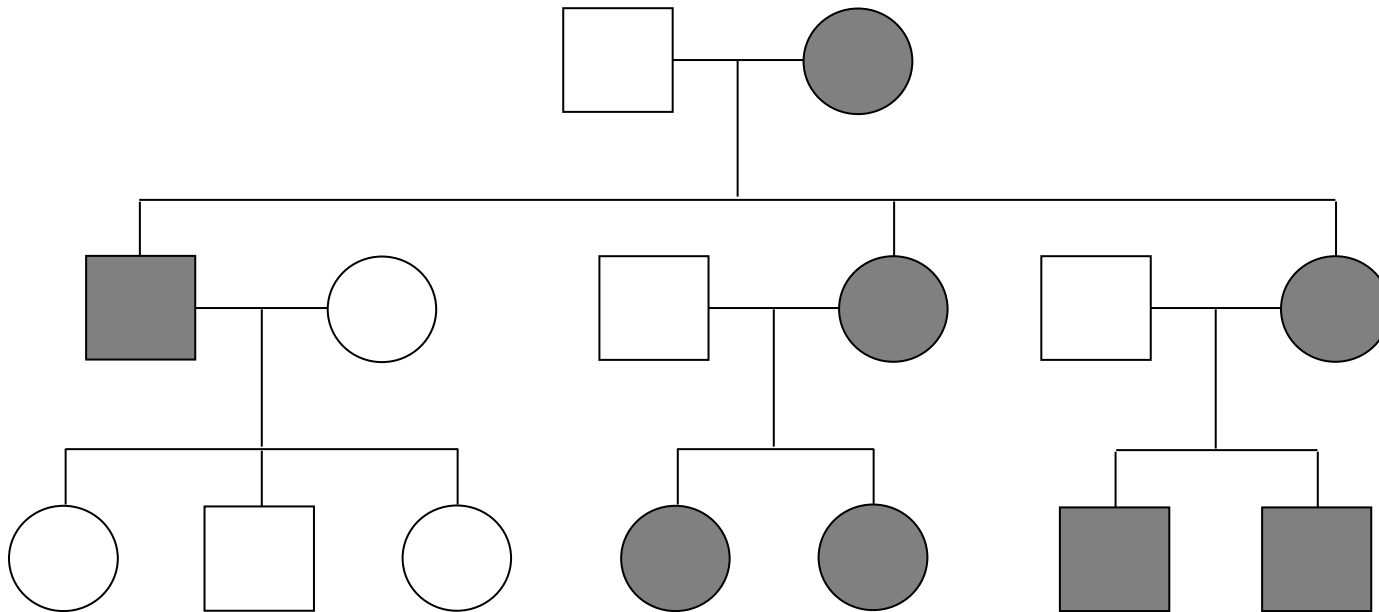


Single-gene Inheritance

X-Linked

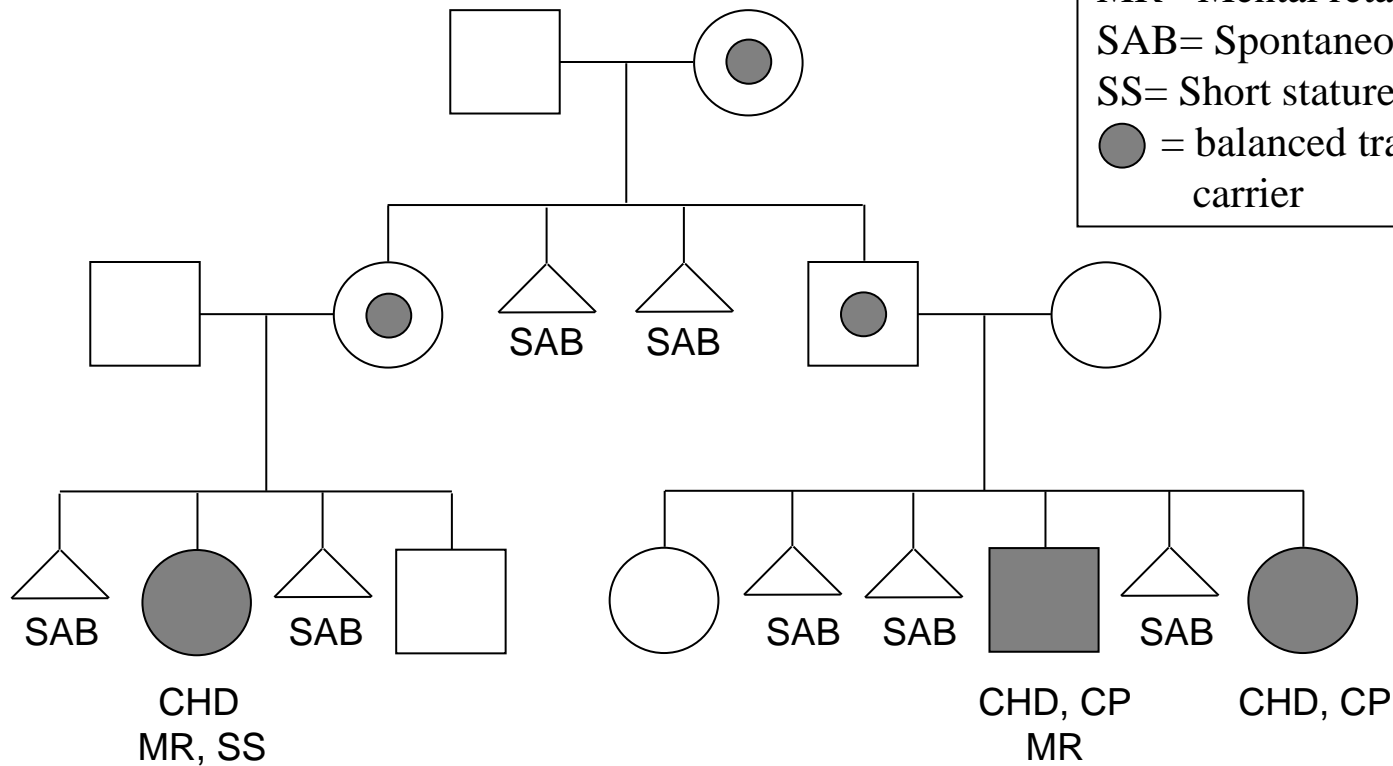


Mitochondrial Inheritance



Chromosomal Translocation

CHD= Congenital heart defect
 CP= Cleft palate
 MR= Mental retardation
 SAB= Spontaneous abortion
 SS= Short stature
 ● = balanced translocation
 carrier



Interpretation

Pedigrees or Checklists?

Crucial element: **THE INFORMATION!**

The method used must:

- 1) be reasonably accurate
- 2) be updated easily
- 3) allow for pattern detection and interpretation
- 4) provide clear communication and interpretation between healthcare providers

Interpretation

Opportunities for Patient Education

- Eliciting and summarizing family history information can:
- ✓ help the patient understand the condition in question
 - ✓ clarify patient misconceptions
 - ✓ help the patient recognize the inheritance pattern of the disorder
 - ✓ demonstrate variation in disease expression (such as different ages at onset)
 - ✓ provide a visual reminder of who in the family is at risk for the condition
 - ✓ emphasize the need to obtain medical documentation on affected family members

Interpretation

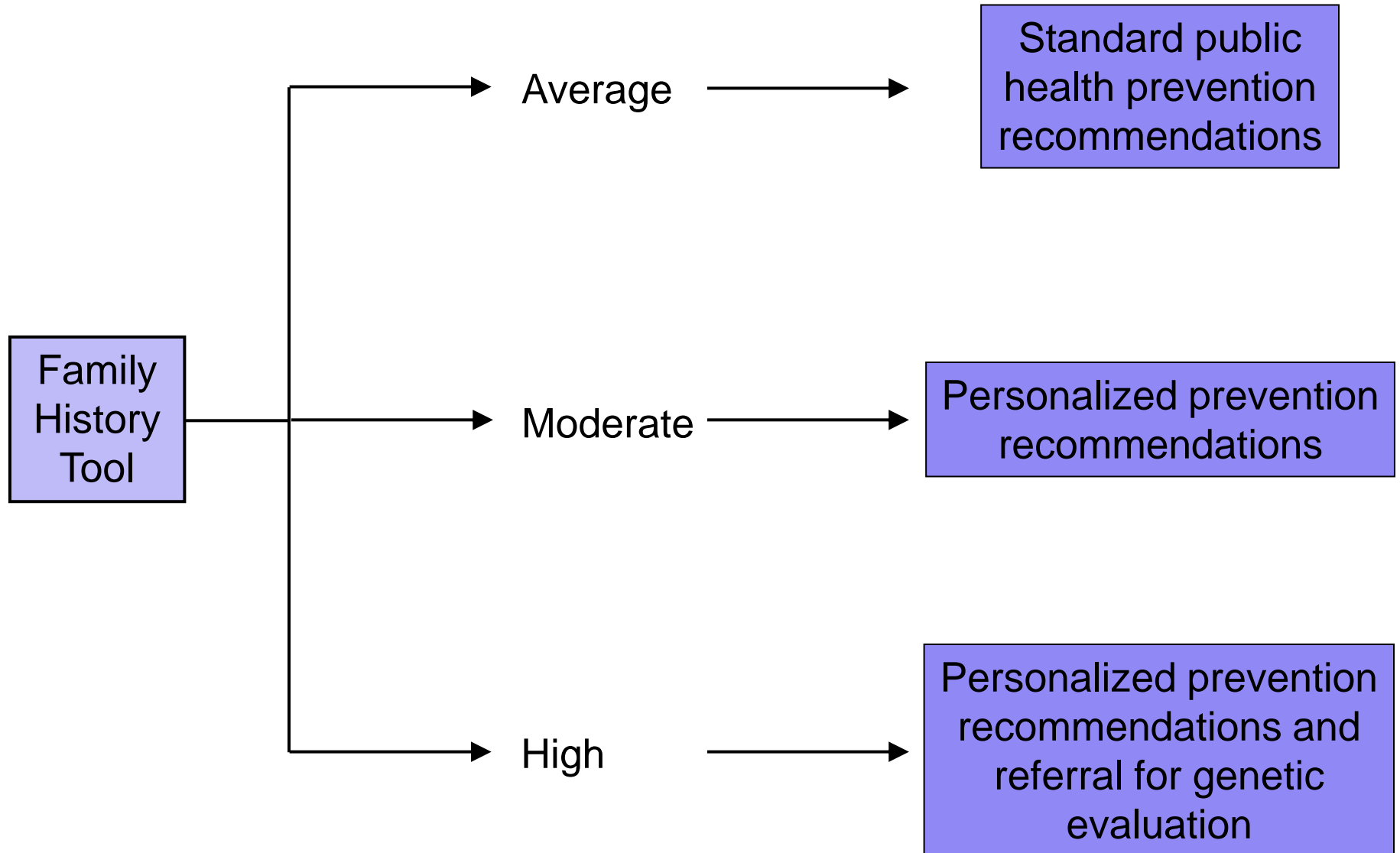
Complicating Factors in Interpretation

- 1) Missing information vs. unaffected relatives
- 2) Reliability of information
- 3) Non-traditional families
- 4) Unknown paternity
- 5) Adoption
- 6) Cultural definitions of family
- 7) Cultural biases
- 8) Consanguinity
- 9) Confidentiality

Intervention

- 1) Identify where more specific information is needed and obtain records
- 2) Assess general risks
- 3) Know when to refer to genetics professionals
- 4) Encourage the patient to talk to other family members
- 5) Update pedigree at subsequent visits

Risk Classification



Available Family History Tools

Surgeon General's Family History Initiative: “My Family Health Portrait”

www.hhs.gov/familyhistory, familyhistory.hhs.gov



My Family Health Portrait
A tool from the U.S. Surgeon General

[Additional Information](#) [Help with this page](#) [en Español](#)

Welcome to My Family Health Portrait

My Family Health Portrait allows you to create a personalized family health history report from any computer with an Internet connection and an up-to-date Web browser.

Information you provide creates a drawing of your family tree and a chart of your family health history. Both the chart and the drawing can be printed and shared with your family members or your healthcare professional. Used in consultation with your healthcare professional, your family health history can help you review your family's health history and develop disease prevention strategies that are right for you.

[Create a Family History](#) OR [Load a Saved Family History](#)

New users can click on Create a Family History to begin creating a personalized family health history. Returning users can click on Load a Saved Family History to edit or update an existing personalized family health history.

Available Family History Tools

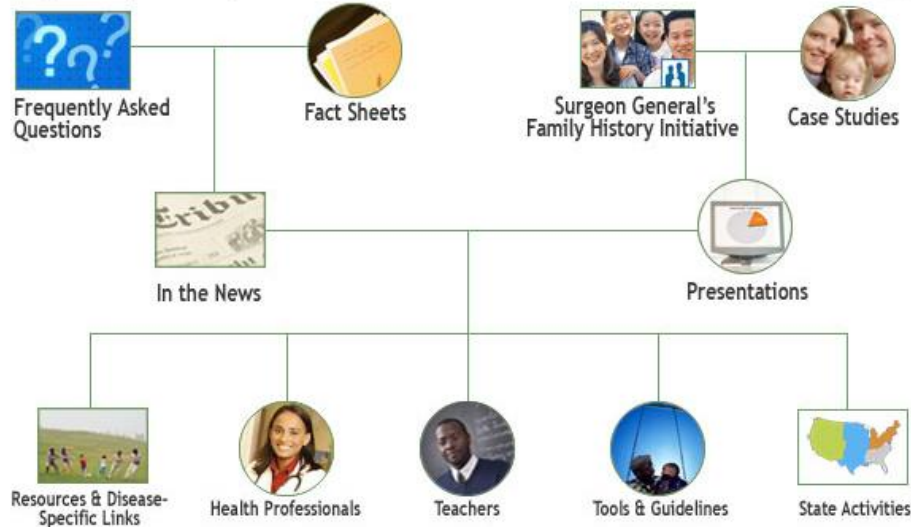
“Family History: Resources and Tools” (CDC)

www.cdc.gov/genomics/public/famhistMain.htm

Family History: Resources and Tools



Using Family History to Promote Health



Available Family History Tools

AMA's Genetics & Molecular Medicine: Family History

www.ama-assn.org/ama/pub/category/2380.html

Family History

[e-mail story](#) | [print story](#)



The importance of a family history

Describes importance of family medical history in disease prevention and provides links to resources on how to collect family history information and generate a simple pedigree.

Prenatal screening questionnaire

Pediatric clinical genetics questionnaire

Adult family history form

Last updated: Jun 20, 2006
Content provided by: AMA Science

Available Family History Tools

“Your Family History- Your Future”
(NSGC, Genetic Alliance, ASHG)



YOUR FAMILY HISTORY – YOUR FUTURE

Your family history holds key information about your past and clues to your future health. Many of your physical traits (such as eye color, hair color, and height) are inherited. So, too, are risks for certain genetic conditions and health problems such as heart disease, diabetes, and some cancers. You may have noticed that some of your relatives are healthier and live longer than other relatives. You may also have noticed that some relatives have the same health problems. By collecting your family’s health history, you can learn what health problems you may be at increased risk for in the future and how to reduce your risks. For instance, people at increased risk for heart disease may be able to reduce their risk through not smoking, regular exercise and diet. Finding out your family history can benefit both you and your relatives... and it can be fun too!

How to Find a Genetics Professional

1. National Society of Genetic Counselors



The screenshot shows the NSGC website interface. At the top right, the text reads "National Society of Genetic Counselors" and "The leading voice, authority and advocate for the genetic counseling profession". Below this is a navigation bar with links: "About Us | Conferences | Resources & Publications | Consumer Info | Career | News Room | Member Benefits | Members Only". On the left side, there is a search bar with the text "Search:" and a "Go" button. Below the search bar is a "Quick Links" section with a list of options: "Find a Counselor", "Join Now", "Contact Us", "Genetic Counseling Foundation", "Site Map", and "Home". The "Find a Counselor" link is circled in red. A red arrow points from this link to a large blue button in the center of the page that says "Find a Counselor". Above this button, the website URL "www.nsgc.org" is displayed in pink text. On the right side of the page, there are several resource tiles: "Journal of Genetic Counseling", "Family History Tool", "Practice Guidelines", "Genetic Discrimination Resources", and "Perspectives in Genetic Counseling".

Find a counselor according to location, institution, or area of specialization

How to Find a Genetics Professional

2. GeneClinics



Welcome to the **GeneTests** Web site, a publicly funded medical genetics information resource developed for physicians, other healthcare providers, and researchers, available at no cost to all interested persons. Use of this Web site assumes acceptance of the [terms of use](#).

www.geneclinics.org

At This Site

▶ **GeneReviews**

Online publication of expert-authored disease reviews

▶ **Laboratory Directory**



International directory of genetic testing laboratories

▶ **Clinic Directory**

International directory of genetics and prenatal diagnosis clinics

▶ **Educational Materials**

- ◆ [Illustrated glossary](#)
- ◆ [About genetic services](#)
- ◆ [PowerPoint® slide presentations](#)

A voluntary listing of US and international genetics clinics providing genetic evaluation and genetic counseling

How to Find a Genetics Professional

3. American Society of Human Genetics



THE
AMERICAN
SOCIETY
OF HUMAN
GENETICS

 [Find a Member](#)

www.ashg.org



Home

Search Membership Database

ASHG GSA ACMG ABGC ABMG
The Genetics Societies Membership Directory

Last update: 11/30/2006

The search is not case-sensitive. You may enter partial last name if no first initial is entered.
Combinations of searches by state, city & country may be made with or without any name input.

Last Name:	<input type="text"/>	City:	<input type="text"/>
First Initial:	<input type="text"/>	State (U.S. Only):	<input type="text"/>
		Country (Leave Blank for U.S.):	<input type="text"/>



Case Examples

Saundra's Family

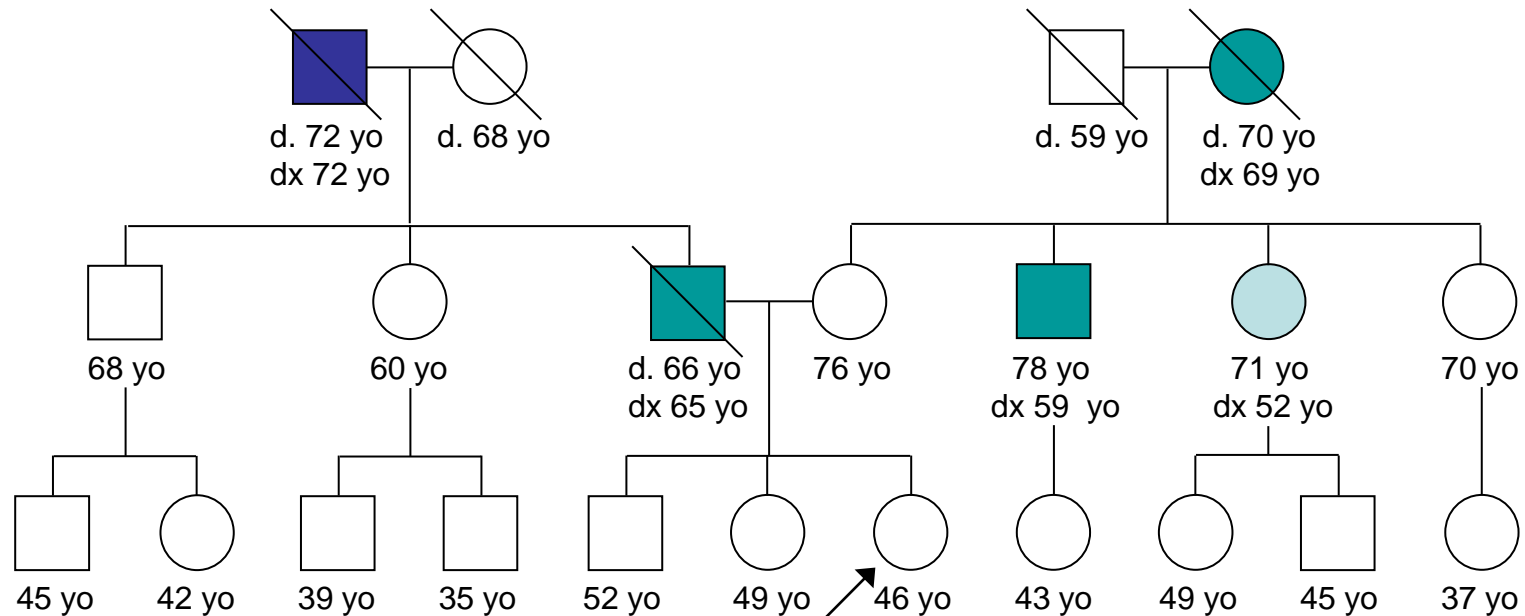
A new patient, Saundra, states that many individuals in her family have had cancer, especially colon cancer. She is certain that she is destined to develop cancer in the near future.


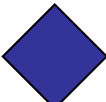
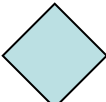
Saundra's Family

How can taking Saundra's family history help to assess her risk to develop colon cancer?

- 1) Identify specific relatives with colon or other cancers
- 2) Identify the ages at the diagnosis of cancer
- 3) Identify family members who have not had cancer
- 4) Identify the side (or sides) of the family on which cancer is present

Saundra's Family

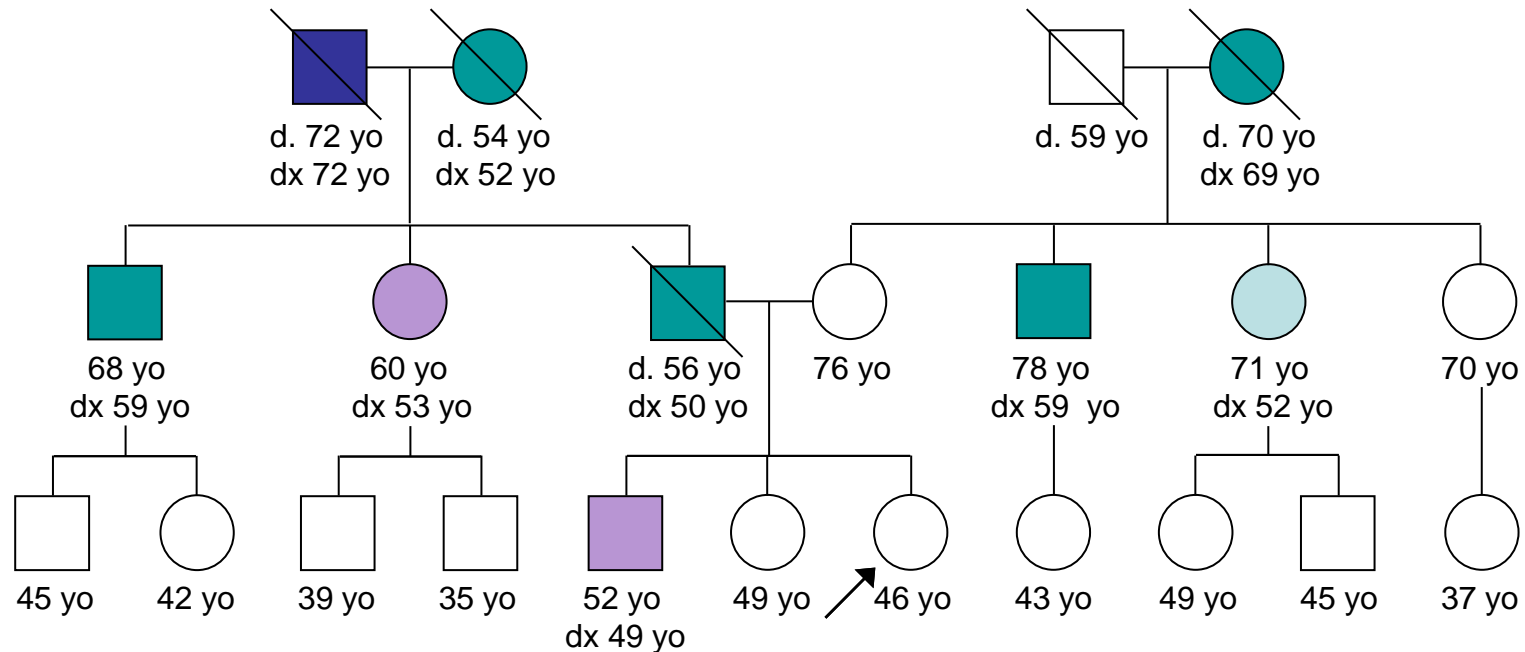



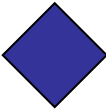

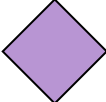
-  Colon cancer
-  Lung cancer
-  Melanoma

Do you think that Saundra has a low, moderate, or high risk of developing colon cancer based on her family history?

How did you assess her risk?

Saundra's Family



-  Colon cancer
-  Lung cancer
-  Melanoma
-  Colon polyps

Do you think that Saundra has a low, moderate, or high risk of developing colon cancer based on her family history?

How did you assess her risk?

Saundra's Family

↓ Factors **decreasing** risk of genetic basis to condition in first scenario

- Cancers common in general population
- Affected relatives are older at diagnosis
- Cancer on both sides of family

↑ Factors **increasing** risk of genetic basis to condition in second scenario

- Affected relatives are relatively young at diagnosis
- Multiple affected relatives concentrated on same side of family

Saundra's Family

Utility of family history tools:

- **Collection**

Focus on diagnoses and ages, as well as affected and unaffected individuals

- **Interpretation**

Consider red flags: multiple affected family members, early age at onset

- **Implementation**

Assessment of risk alters recommended surveillance

Toby' s Family

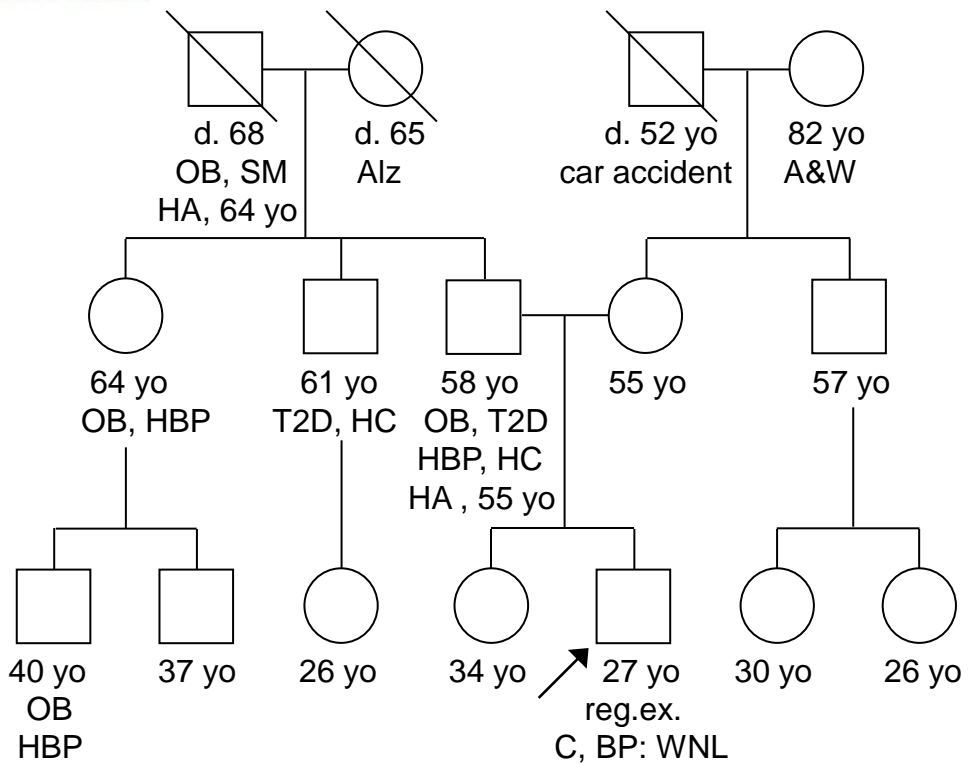
During a routine visit, Toby mentions that he is extremely conscious of his physical health because he does not want to get heart disease like the other members of his family.

Toby' s Family

How can taking Toby' s family history help to assess his risk to develop heart disease?

- 1) Identify specific relatives with heart disease and associated complications
- 2) Identify the ages at onset of disease
- 3) Identify the presence or absence of risk factors in relatives with heart disease

Toby's Family

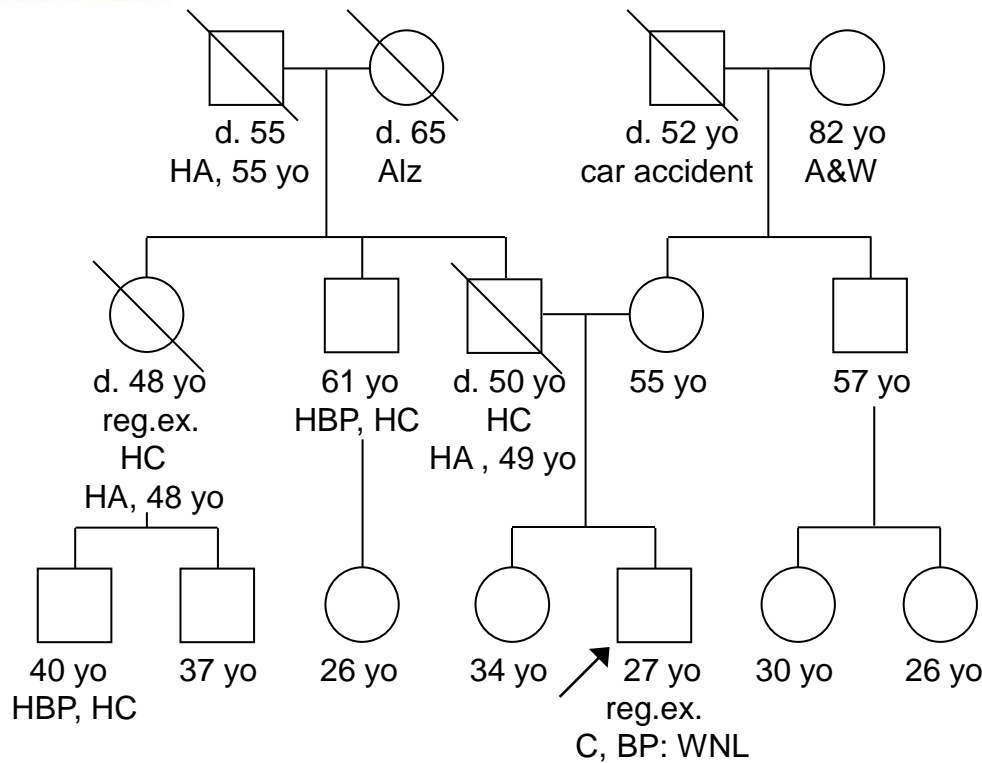


A&W: alive and well
Alz: Alzheimer's
HA: heart attack
HBP: high blood pressure
HC: high cholesterol
OB: obese
RegEx: regular exercise
SM: smoker
T2D: type 2 diabetes

Do you think that Toby has a low, moderate, or high risk of developing heart disease based on his family history?

How did you assess his risk?

Toby's Family



A&W: alive and well
 Alz: Alzheimer's
 HA: heart attack
 HBP: high blood pressure
 HC: high cholesterol
 OB: obese
 RegEx: regular exercise
 SM: smoker

Do you think that Toby has a low, moderate, or high risk of developing heart disease based on his family history?

How did you assess his risk?

Toby' s Family

- ↓ Factors **decreasing** risk of genetic basis to condition in first scenario
- Affected family members have multiple risk factors, some of which are environmental
 - Affected relatives are older at diagnosis
- ↑ Factors **increasing** risk of genetic basis to condition in second scenario
- Affected relatives are relatively young at diagnosis
 - Disease in the absence of risk factors

Toby's Family

Utility of family history tools:

- **Collection**

Focus on diagnoses and ages at onset; also consider presence or absence of risk factors

- **Interpretation**

Consider red flags: multiple affected family members, early age at onset, disease in the absence of risk factors and in the less-often-affected sex

- **Implementation**

Assessment of risk alters recommended testing and health management

Baby Maria's Family

Maria (one month old) was born with a cleft lip and palate (CL/P). CL/P is commonly isolated, but can also be a part of a number of different inherited syndromes.

Baby Maria' s Family

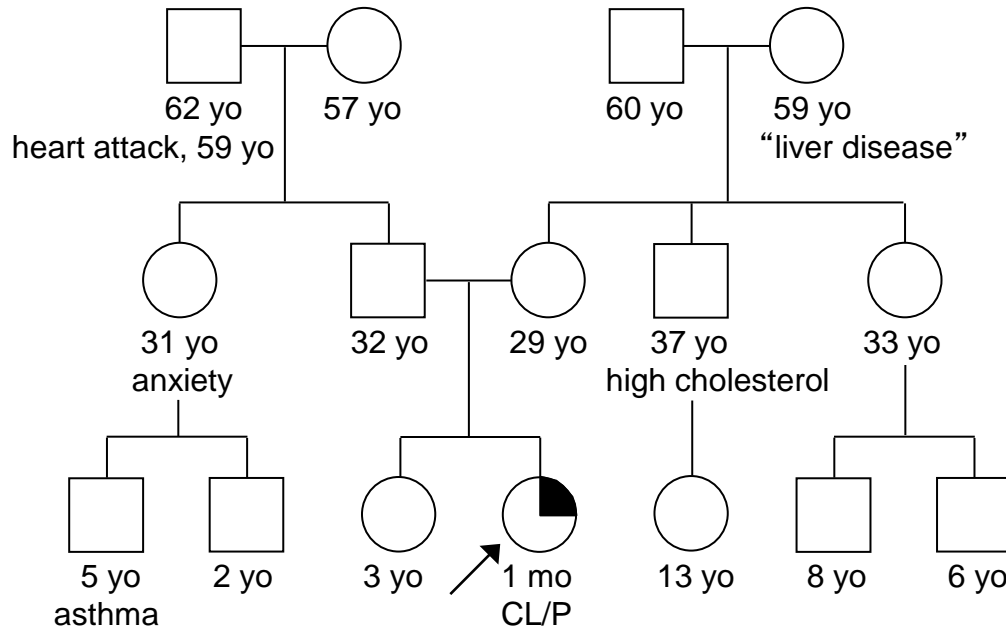
How can taking Maria' s family history help assess whether her CL/P is isolated or syndromic?

- 1) Identify whether features are present in other family members that are suggestive of a syndrome
- 2) If features are present, identify an inheritance pattern

Why is this helpful?

- ⇒ Better management of associated health problems
- ⇒ Determine recurrence risk for future children

Baby Maria's Family



Key:



Cleft lip and palate

Do you think that there is a low, moderate, or high chance that Maria's cleft lip and palate is due to an inherited condition?

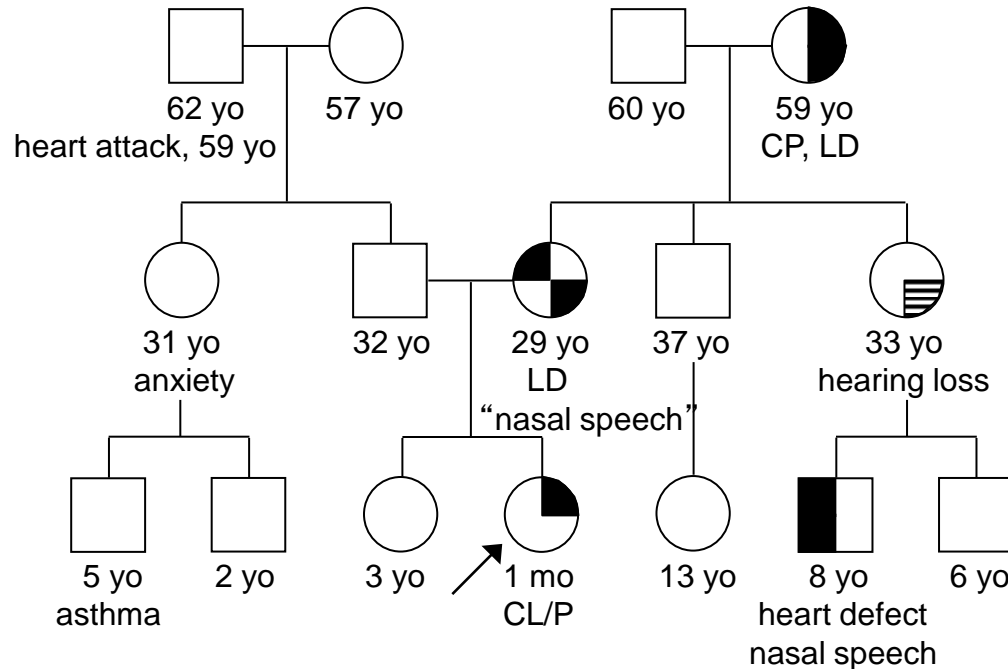
How did you assess this chance?

Baby Maria's Family

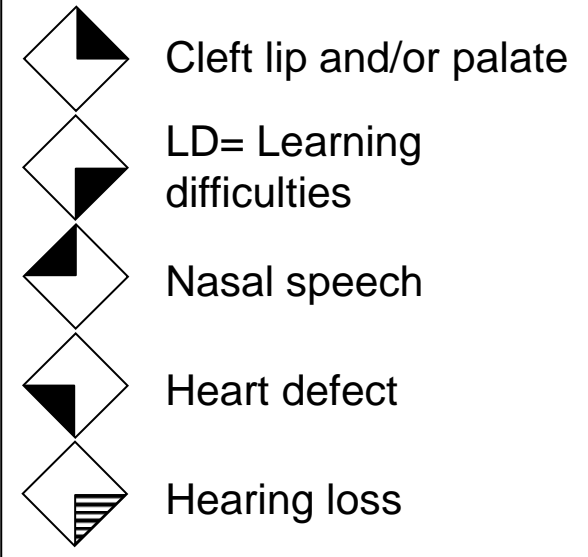
Isolated Cleft Lip and/or Palate:

- 1 in 1000 births (0.1%)
- Recurrence risks
 - Maria's sibling: 2%-8%
 - Maria's child: 4%-6%

Baby Maria's Family



Key:



Do you think that there is a low, moderate, or high chance that Maria's cleft lip and palate is due to an inherited condition?

How did you assess this chance?

Baby Maria' s Family

22q Deletion syndrome:

- Deletion of submicroscopic deletion of ch. 22q
- Inheritance: autosomal dominant
- Recurrence risks:
 - Maria' s sibling: 50%
 - Maria' s child: 50%
- Primary features:

Congenital heart defects	Immune deficiency
Cleft lip and palate	Hypocalcemia
Learning difficulties	Characteristic facies

Baby Maria's Family

- ↓ Factors **decreasing** risk of inherited syndrome in first scenario
- Presence of non-specific health conditions common in the general population
 - Features on both maternal and paternal sides
 - No clear inheritance pattern or family clustering
- ↑ Factors **increasing** risk of inherited syndrome in second scenario
- Clustering of potentially related features
 - Several genetic red flags are present
 - Clear autosomal dominant inheritance

Baby Maria's Family

Utility of family history tools:

- **Collection**

Specifically ask about features that are often seen in syndromes associated with CL/P

- **Interpretation**

Consider red flags: multiple affected family members, early age at onset, developmental delays, one or more major malformation

- **Implementation**

Presence of a syndrome can alter recurrence risks and health management for the patient and family members

Anne and Geoff

Anne and Geoff want to start a family. Following ACOG guidelines, Anne's physician makes cystic fibrosis (CF) carrier screening available to all her patients, and recommends screening to her patients who are Northern European (including Ashkenazi Jewish) or who have a family history of CF.

Anne and Geoff

How can Anne and Geoff's family histories help the physician decide whether to recommend CF carrier testing or simply make it available to Anne and Geoff?

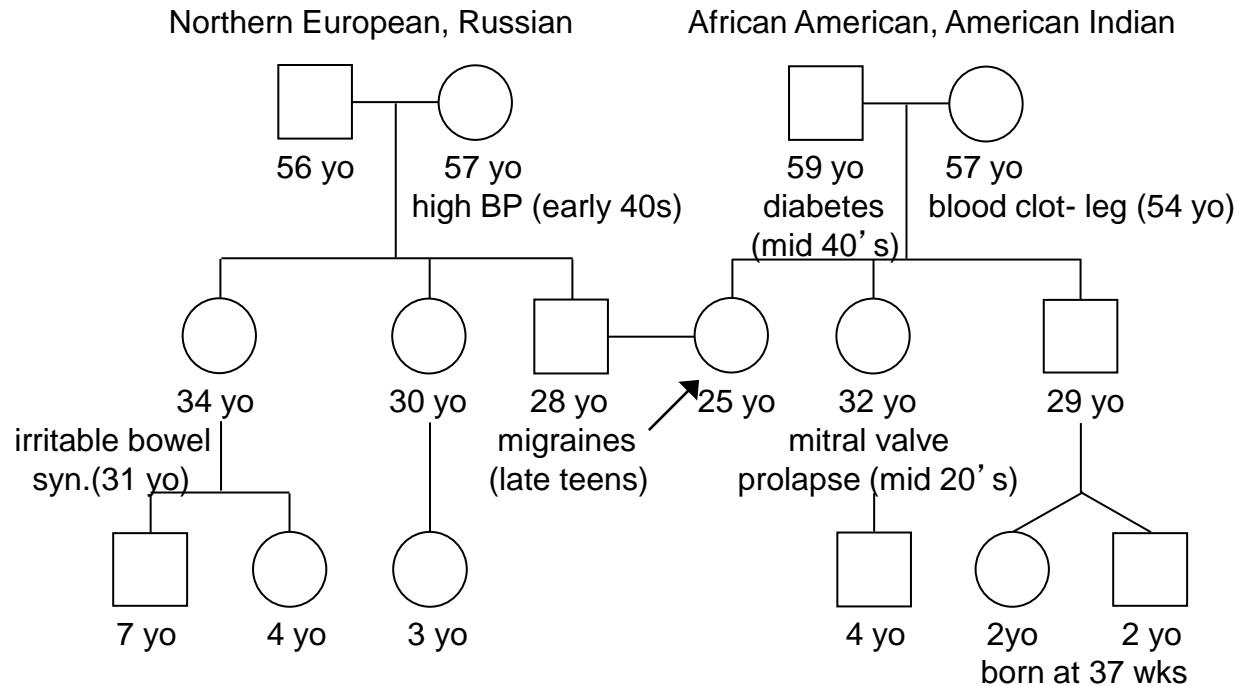
- 1) Identify whether CF is present in the family
- 2) Determine whether Anne or Geoff are of ancestries for which CF carrier screening is recommended
- 3) Identify other family members who may consider carrier testing

Anne and Geoff

Cystic Fibrosis:

- Multisystem disease
 - Pulmonary: accumulation of mucus
 - Digestive: malnutrition and constipation
 - Reproductive: bilateral absence of vas deferens (infertility)
- Inheritance: autosomal recessive
- Average life span: young adulthood

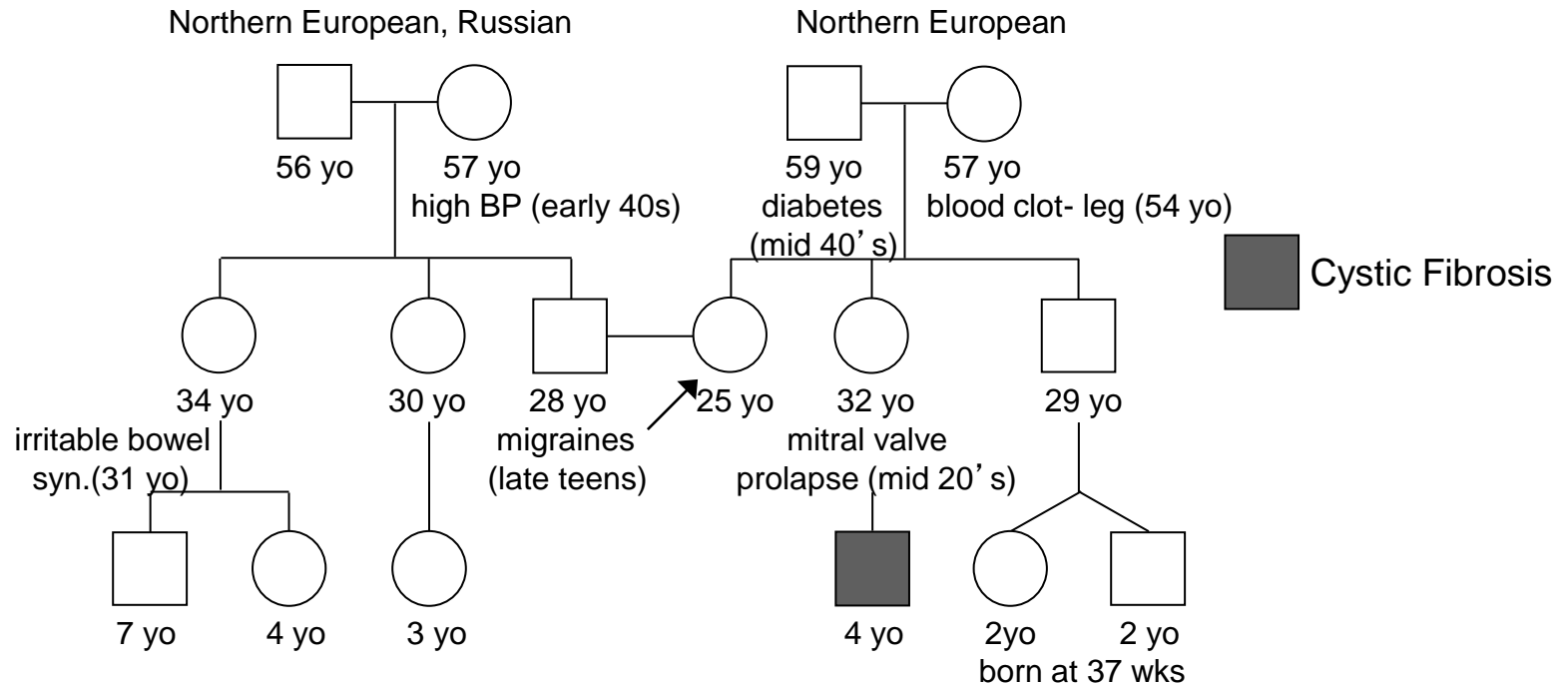
Anne and Geoff



Do you think that there is a low, moderate, or high chance that either Geoff or Anne are carriers of a CF mutation?

How did you assess this chance?

Anne and Geoff



Do you think that there is a low, moderate, or high chance that either Geoff or Anne are carriers of a CF mutation?

How did you assess this chance?

Anne and Geoff

- ↓ Factors **decreasing** risk of being a CF carrier in first scenario
- Anne's ancestry has a lower carrier frequency
 - No family history
- ↑ Factors **increasing** risk of being a CF carrier in second scenario
- Both Anne and Geoff are of Northern European ancestry
 - Positive family history: Anne's nephew (second-degree relative) has CF

Anne and Geoff

Utility of family history tools:

- **Collection**

Elicit ancestry of biological grandparents, relevant health information

- **Interpretation**

Consider red flags: known family history, ethnic predisposition; autosomal recessive inheritance

- **Implementation**

Assessment of risk determines whether carrier testing is offered; may also consider prenatal testing, pregnancy surveillance, or preparation for CF management

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