**Accepts—Science v. Choice**

 As has been noted, I am a physician by training. I have worked as a general practitioner and in public health where I have been involved with understanding HIV infection and AIDS and preventing them from the earliest days of the epidemic. I still well remember the first AIDS funeral I attended of a schoolmate. He was an organist and had come out as gay some time after our school years; I was the only one I knew from our school days who attended. In many parts of the world HIV infection has been closely related to sexual identity. So I had to become more comfortable in thinking about and talking about that area if I was going to do my job successfully. I have developed AIDS prevention projects in Africa that were funded and I worked for a decade and a half developing and operating a system of health care for prison inmates; 70,000 in 70 New York State prisons. When I began working there, about 1 in 6 of the inmates had HIV infection. While I have had some understanding of human sexual orientation, in preparation for this I went back to the literature to try to understand the issue better before presenting it to you.

I must begin by saying that nobody, especially me, fully understands all the determinative factors leading to human sexual orientation. Like most aspects of science dealing with humans and human behaviour it seems that the more study that is done the more complex the factors and the interaction of the factors involved seem

What is important for me to understand, and hopefully for you, is the extent to which sexual orientation is volitional, that is by choice, and to what extent it is determined for us by “nature” if you will. I will be discussing some of the factors that have been observed, the evidence that has been found that some factors seem to be associated with sexual orientation and that some of them seem not only to be associated with but also causally related to sexual orientation. (Please note that I will be using the term “homosexuality” in contradistinction to “heterosexuality” and rather than “non-heterosexuality” and rather than lesbian and gay or LGBT because much of the literature uses the terminology and the discussion is often less complex. I am using the terms as descriptive, not as pejorative or judgmentally.)

 First, to deal with an issue that some, including recently a well-known Philippine boxer, raise: are humans the only creatures who have homosexual activities as he claimed few weeks ago? There is documented evidence that at least 1500 species of mammals, birds, reptiles and insects have homosexual behaviour. One widely-cited animal study by a scientist at Oregon Health and Sciences University in the US studied homosexually oriented rams and found that their brains resembled those of female sheep.

 If I were to go around the room and look in your eyes I would see some of us have brown eyes and others blue eyes or grey eyes. (Of course it is possible to have tinted contact lenses but that does not change the colour of eyes, only of how the eyes are seen by others.) So what determined the colour of your eyes? [ ]

 Looking around the room, I see some of us have less hair than we used to have. (I won’t talk about hair colour since that can easily be changed out of a bottle or by a skilled hairdresser.) But how many of us have **chosen** to go bald? [ ] There is something called “male-pattern baldness” that some of us have inherited. (Of course we can choose to minimize how bald we appear to be by a comb-over (think Donald Trump!) or by a toupee or by shaving the head, but none of those change the fact that we are or are getting bald!)

 How many of us in the room are right-handed? [ ] Of those who are not right-handed, when did you choose to be left handed? [ ] (I would note that the Latin for left handed is “sinister.” It has to do with how a minority is perceived, particularly if it meant the left handed person carried his weapon in the hand others did not expect.)

 A couple of the major issues with scientific studies are the **samples studied** and the **definitions used**. Is sexual orientation physical actions only, is it desires and fantasy life, or does it include physical activities and desires and fantasy life? Kinsey included both, but Kinsey’s studies were mostly self-reports, as are many other studies. That means the persons being studied are self-selected and self-selected populations often do not accurately reflect the actual whole population. (Think how different political attitudes would be shown for people who call in to “shock jocks” on the radio versus a statistically valid sample of adults in the country.)

 But how are heterosexuality and homosexuality defined, other than by the person involved and what he or she chooses to divulge to the person doing the study? There are ways to electronically measure mental and physical arousal but those are quite intrusive, difficult to accomplish and expensive. Thus many of the studies, especially early studies, those before about 2000, tend to have small sample size, as well as to be self-reports.

 The ideal, from a scientist’s standpoint would be to have a physical characteristic that could be measured and would have absolute concordance with whether a person is homosexual or heterosexual. While it might be useful for studies, it would surely be misused by others.

Most of us had some passing exposure to early genetic studies when we were in school. (Remember Mendel and his observations of colour of peas?) We know that it is not as simple as Mendel first determined based on his observations. While there are dominant genes, even when both precursors have dominant genes, the physical characteristic is not always the same; there is less than complete “penetration” or “expression” of the dominant gene. And when one of the precursors has a dominant gene and the other a recessive gene the resultant offspring have a mixture of characteristics and it is not always the same mixture proportion.

 Some of the earliest studies of sexual orientation had to do with twins, monozygotic and dizygotic twins, or as we more commonly call them “identical twins” and “fraternal twins.” Monozygotic or identical twins, develop from one egg that is fertilized by one sperm, splits into two and those two become two separate individuals, and, theoretically at least, those two separate individuals have the same genetic material. When first you meet a pair of identical twins you probably can’t tell them apart, especially if they don’t want you to! But parents can usually tell them apart; there are differences, albeit relatively smaller differences than there are between two siblings who are not twins. Yes, two non-twin siblings may resemble each other, and we may resemble someone to whom we are not related, but identical twins are more similar, if not exactly the same.

 If one male **identical twin** is homosexual, studies have shown that 65% of second twins are also homosexual. But if one male **fraternal twin** is homosexual only 15% of the second twins are also homosexual. Clearly the concordance or similarity is not 100% even in identical twins who started out with the same genetic material, but it is much higher than the 4% in the general population. Thus there is a very clear statistical association of something genetic with sexual orientation. The similarity of sexual orientation is less in female twins than in male twins. (Which is the first of a number of findings that imply that the factors involved in male homosexuality may be different from those involved in female homosexuality. It has also been found that female’s sexual orientations appear to be more fluid than males. They are more likely to be bisexual than exclusively homosexual which is opposite what has been found in males.)

 Homosexuality tends to run in families. The probability that the brother of a homosexual male will be homosexual is about four times higher than in the population as a whole. But sisters with a gay brother are NOT more likely than the general population to be lesbian and similarly the brothers of a lesbian are not more likely to be gay. And in families with homosexual offspring, the increased tendency tends to be on the maternal side, that is, a homosexual male is more likely to have maternal nephews and uncles who are homosexual than relatives on his father’s side.

 Another interesting finding is that the more older brothers a boy has, the greater the likelihood that the boy will be homosexual. The odds increase by 33% for each older brother. (Please note that is an increase in likelihood, not a probability of the boy being homosexual. One report noted an increase from 2% for the first son to 6% for the fifth son. About one in seven homosexual men have that younger brother factor which apparently is related.

 Then we can look at somatic characteristics. The ratio of the length of fingers is an interesting example. The usual measure studied is the ratio of length between the right index finger (2D) and the fourth finger (4D). This difference is apparent as early as the 2nd year of age. Statistically, both male and female homosexual people have **lower** 2D:4D ratios than heterosexuals. (That can be and has been measured and is less likely to be a reporting bias than the Kinsey data which self-reported, for example, larger genitalia in heterosexual men than in homosexual men. )

 The portion of the inner ear called the cochlea generates very soft clicking sounds. (These are not something that we can consciously hear but they can be and have been measured.) These sounds are more numerous in the right ear and in females than in males. The pattern is consistent in infants, children and adults. There is no difference between homosexual and heterosexual males but the sounds are less numerous and weaker in homosexual and bisexual women than in heterosexual women.

 Several differences have been measured in neuroanatomy of the brain between males and females and between homosexual and heterosexual males. The differences in measurement of size and shape don’t always differ in the same direction between males and females but the measurements of homosexual males are part way between the female measurement and the heterosexual male measurement.

 Finally there is “handedness.” Handedness is generally considered to be an important indicator of specialization of the hemispheres of the brain necessary for development of motor skills, language and cognition. Most people are right handed but some are left handed and some are ambidextrous (which can be an advantage in some sports such as baseball) and some do some activities better with one hand and others better with the other. Approximately 85% of adults are right handed, 10% are left handed and 5% have mixed handedness. Left handedness is 25% higher in males than in females. At least 4 types of factors have been shown to be involved in determining handedness: neuroanatomy and neurophysiological factors, genetic, pathological and sociocultural. The corpus callosum part of the brain is 11% larger in left-handed and ambidextrous individuals. This is measurable! For biological children (but not for non-biological children) there is a one in 10 likelihood that two right handed parents will have a left handed child. If one parent is right handed and the other is left handed, the likelihood that the child will be left handed is 2 in 10 and if both parents are left handed the likelihood is between 4 and 5 in ten. It has been found that a single gene has two differing alleles that increase the likelihood of right or left handedness. And in identical twins up to 25% of the twins have different handedness. Birth-related stress is involved; the left hemisphere (which is dominant in right handedness) gets less blood volume although it requires more blood and burns oxygen more quickly. Testosterone appears to affect the left hemisphere more strongly. Handedness is usually apparent in infancy and is considered stable by 5 years of age. That’s interesting, you say, but what has it got to do with my topic for today, sexual orientation? A meta-analysis of 20 studies has shown 34% greater non-right handedness in male homosexuals than in male heterosexuals and 91% greater in homosexual females than in heterosexual females. Finally, yes left-handers can be forced to write right handed, and schools used to do just that, but many studies show that the individuals have decreased academic performance, memory deficit, difficulty concentrating, et al. Switching an adult back to the inherently preferred left hand can reduce or do away with the problems. In the same way, trying to “treat” a homosexual individual, one who has the genetic, neuro-anatomical, hormonal differences, trying to force-fit them into being heterosexual will NOT change the sexual orientation (although it might change behaviour, but it is likely to result in serious adverse effects on the individual.)

 So if there are measurable differences between heterosexual and homosexual individuals, the obvious question is, why? Published studies mostly agree that sex hormones are involved, both prenatally and postnatally. What they do not agree on are the mechanisms involved. No single mechanism that has been proposed and studied seems to explain all of the observations. Concerning male homosexuals, prenatal androgen exposure seems to best explain the findings. Both androgenic hormones and estrogenic hormones are involved, particularly in female homosexuals. Over-exposure to androgens seems to be related with development of female homosexuality. One interesting finding is that women who were exposed to diethylstilboestrol (DES) in utero (when the pregnant woman was treated to prevent hyperemesis, vomiting) not only have a greater tendency to develop clear-cell adenocarcinoma of their vagina and cervix (genital) cancer and breast cancer but have a higher rate of reported bisexual or homosexual preferences. Estrogens are masculinising in males and DES is a particularly strong estrogenic compound that appears to bypass the known inactivation mechanisms that protect the female foetal brain from high maternal estrogen levels.

One of the more interesting possible mechanisms for the increase in homosexual males who have older brothers has to do with maternal immunology. Some of you know that Rh factors are checked in mothers prenatally because if a Rh-negative mother has had a child who has positive Rh factor—developed from a father who has positive Rh factors, the mother may have developed antibodies against Rh which can attack future foetuses as though the mother is allergic to them. Mothers absorb blood products from the foetus during birth which explains the presence of those “foreign” proteins (foreign to the mother’s body) and the resulting antibodies she develops. In a somewhat similar process, mothers of boy babies may absorb “foreign (male) proteins” during birth of those boys and the more previous boy babies the more likely the immune response which may relate to androgenic hormone exposure differences in subsequent male foetuses. Not all studies support that and the proposed mechanism only explains part of the differences. But it is an interesting and plausible possibility.

From my reading, it appears that we have really oversimplified the issue into a binary: heterosexual: homosexual when it is probably closer to a continuum. It appears that there is interaction of at least 4 types of factors: genetic, physiological, intrafamilial and cultural.

There is **no** scientific evidence that abnormal parenting, sexual abuse, or other adverse life-events influence sexual orientation. (And for those who would raise the issue of “bubba” and homosexual activity during incarceration, that is better explained by power and availability than by sexual orientation which is usually established during early childhood, long before incarceration.)

I have focused more on biological differences than psychological differences, since they are more reproducibly measured, and my task today was not to provide an exhaustive scientific survey but to identify that there are factors other than “choice” involved in an individual being defined as homosexual.

Certainly social and cultural factors will influence whether an individual **acts upon** his/her sexual orientation or hides it from others. **That** may indeed be a choice, albeit with sometimes very serious consequences.

My summary is that evidence appears to show that determinants of homosexuality or should I say the sexual-orientation continuum, are complex but “choice is not one of them!” I don’t understand that any of us have “chosen” to be heterosexual or homosexual in our sexual orientation. What I am certain of is that all humans are God’s children, making everyone my sister or my brother! The choice involved is whether we are able and willing to accept everyone as our brother or sister! My God does not choose to love only some of His children. We ARE ALL God’s children! Can we choose to accept all?

**References**

The following are a few references discussing the known determinants of human homosexuality. I have focused on reports of physical and relational/familial differences, which can be reliably measured, rather than psychological differences, which measurements tend to be more subjective. Given the widely published physical and relational/familial differences I have not included papers which claim that homosexuality is determined solely by developmental-psychological factors. Papers advocating that position can be found in the Linacre Quarterly published by the Catholic Medical Association.

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