Background
In rodents, reduced social contact is associated with decreased myelin integrity (Li et al., 2012) and this relationship is mediated by increased activation of inflammatory pathways (Hermes et al., 2005). While pathologic inflammation is known to affect myelin integrity in primates (Hausser & Oksenberg, 2006), this relationship between characteristics of social network and white matter integrity has yet to be demonstrated in humans.

Hypothesis
More diverse and larger social networks will be associated with increased white matter integrity. This relationship will be associated with decreased levels of inflammatory activity.

Methods
Participants
Neurologically healthy adults (N=155; mean age = 40.7) were recruited via mass mailings to residents of Allegheny County, PA. All testing was approved by the local IRB. There were 101 males and 54 females. A breakdown of participant characteristics is given in Table 1. Additional demographic characteristics are given in Table 2. All tests were performed on the Siemens Trio 3T scanner located at the University of Pittsburgh Medical Center.

Imaging Acquisition Parameters
Siemens Trio MRI (Siemens Inc., USA) located at the Magnetic Resonance Research Center at the University of Pittsburgh Medical Center.

Diffusion Tensor Imaging (DTI): 30 directions, 3mm isotropic voxels, 43 slices, TR = 5800 ms, TE = 91ms.

White Matter Integrity Measures
Fractional Anisotropy (FA): Degree of anisotropy of underlying water diffusion.
Radial Diffusivity (λ3): Strength of water diffusion in orthogonal plane to principle anisotropy direction.

SNI associations with FA
Across all white matter voxels there was a predominantly positive association between FA and SNI (Div). No such pattern was seen for size of a social network (not shown).

IL-6 and FA
Within the significant cluster, we found a simple correlation between FA and circulating levels of IL-6 (r(126) = -0.14, p = 0.017). The correlation with CRP was trending, but not significant (r(135) = -0.12, p = 0.084).

Potential mediating pathways
Overall, we were unable to find any factors that served as indirect mediators of the relationship between SNI (Div) and FA within the significant cluster, after controlling for age and sex.

Summary
- The diversity of a person’s social network positively correlated with the microstructural integrity of white matter pathways in the brain, particularly in fibers connecting frontal areas.
- Patterns of white matter differences with social network diversity resembled patterns consistent with variation in myelin integrity.
- While inflammation was not a significant mediator, white matter integrity negatively correlated with levels of systemic inflammation.
- Future longitudinal studies, with larger sample sizes, are needed to determine whether changes in inflammation may mediate the relationship between social contact and white matter integrity.

References