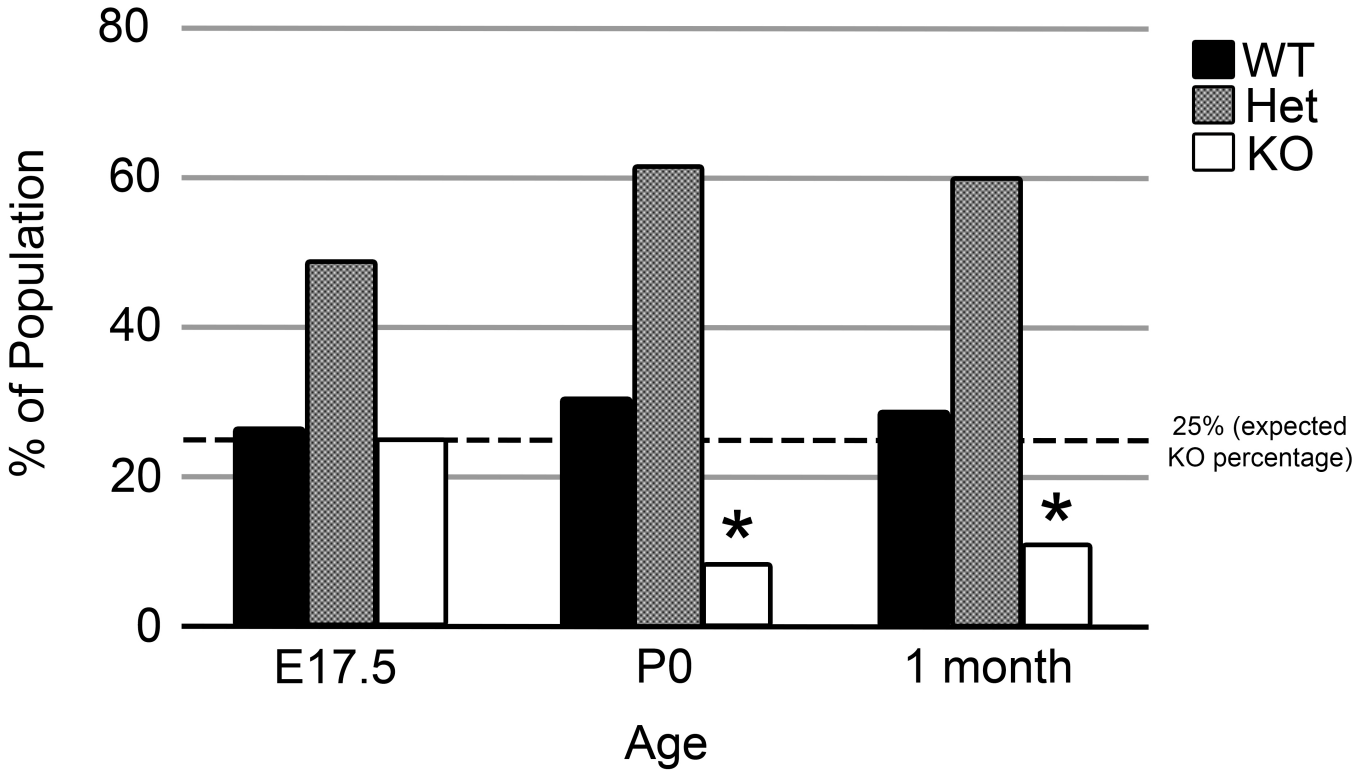
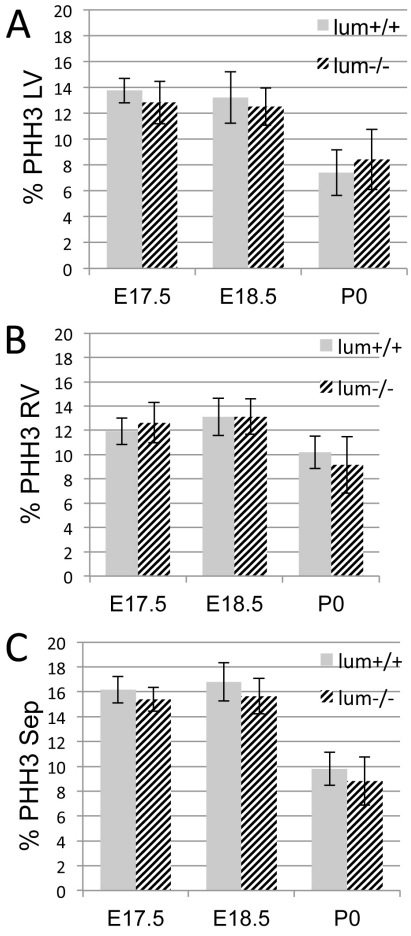
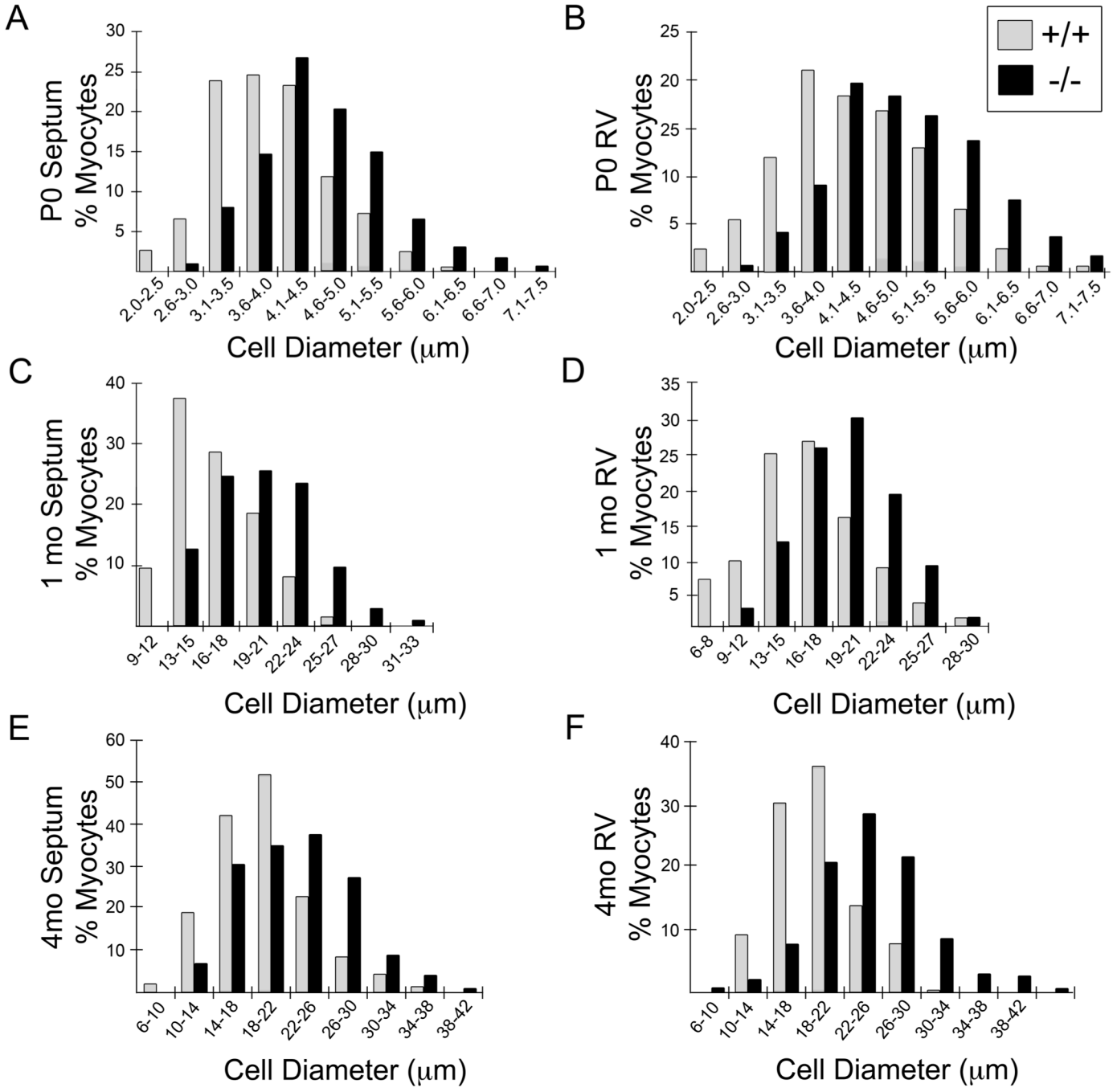
Supplemental Data:



Supplemental Fig. 1: Lumican deficient mice on the C57BL/6 background exhibit significant perinatal death. Lumican deficient mice (*lum*$^{-/-}$)(S. Chakravarti et.al., 1998 *J. Cell Biol. 141(5)*, 1277-86) were used in this study. Since the time of original report, the *lum*$^{-/-}$ mice have been crossed into the C57BL/6 and are now on a pure C57BL/6 genetic background. *Lum*$^{-/-}$ exhibited a significant amount of perinatal death on the C57BL/6 background, not reported for *lum*$^{-/-}$ on the CD1 background. Mendialian genetics from fetal staged embryos (E17.5) of heterozygous *lum*$^{+/-}$ matings revealed that there was no deviation from the expected Mendialian genetic ratio of *lum*$^{-/-}$ compared to WT; however at P0 and 1 month there was a significant reduction in *lum*$^{-/-}$. * -denotes statistical significance; P0, $P < 4.12 \times 10^{-5}$; 1 mo, $P < 2.73 \times 10^{-5}$.



Supplemental Fig. 2: Cell proliferation in the left ventricle, right ventricle and septum is not significantly altered in the lumican deficient mice. Proliferation was examined within the ventricular chambers of the *lum*$^{-/-}$ compared to WT littermates at E17.5, E18.5 and P0. There was no significant difference in the proliferation rates as measured by phosphoHistone H3 (PHH3) positive cells in the *lum*$^{-/-}$ compared to WT littermates within the LV (A), RV (B) or Septum (Sep, C). The average rate of proliferation was reduced in all ventricular regions at P0 compared to embryonic time points (A-C). The overall rate of proliferation in the septum trended higher than other regions at all time points examined (C). *P* values from Student's ttest-Left ventricle (LV): E17.5, P<0.40; E18.5, P<0.54; P0<0.50. Right ventricle (RV): E17.5, *P*<0.53; E18.5, *P*<0.99; P0, *P*<0.60. Septum (Sep): E17.5, *P*<0.35; E18.5, *P*<0.40; P0, *P*<0.52.



Supplemental Fig. 3: Myocardial cell size was increased in the right ventricle and septum of lumican deficient mice. The diameter of α-sarcomeric actin positive cardiomyocytes was determined in the septum and right ventricular (RV) tissue of *lum*$^{-/-}$ and WT littermate hearts at postnatal day 0 (A, B; n=4 WT, n=4 *lum*$^{-/-}$), 1 month (C, D; n=5 WT, n=8 *lum*$^{-/-}$) and 4 months (adult, E, F; n=3 WT, n=2 *lum*$^{-/-}$). Grey bars denote WT and black bars designate *lum*$^{-/-}$ measurements. The graphs in A-F show the percentage of total cardiomyocytes measured (Y-axis) that fall into the size (μm) range of diameter groups designated on the X-axis. In addition the average sizes of the cardiomyocytes of the *lum*$^{-/-}$ was statistically significant in all regions, at all stages: P0 septum, $P < 6.9 \times 10^{-18}$; P0 RV, $P < 6.3 \times 10^{-10}$; 1 mo septum, $P < 0.002$; 1 mo RV, $P < 0.04$; 4 mo septum, $P < 5.0 \times 10^{-7}$; 4 mo RV, $P < 2.4 \times 10^{-10}$. *P* values from Student's t-test.