**Supplementary Methods**

NuvaRings® collected from participants in both studies were stored at -80°C, processed and analyzed in the same manner. Prior to analysis of NuvaRings® from study participants, the following method was performed on 6 unused NuvaRings® providing etonogestrel (11.7 mg) and ethinyl estradiol (2.7 mg) levels consistent with those provided in the product insert. NuvaRings® were brought to room temperature, rinsed in deionized water, patted dry and weighed. They were then cut into quadrants (1, 2, 3, and 4) and each quadrant was cut into 3 sections (A, B, C) which were weighed individually. Etonogestrel and ethinyl estradiol were extracted from two opposing sections (example, 1A and 3A) by placing the sections in separate scintillation vials containing 10 mL ethyl acetate and incubating for 48 hours (25°C). Each ethyl acetate extraction was diluted 1:10 in phosphate buffered saline (PBS) and analyzed by high-performance liquid chromatography (Shimadzu Prominence HPLC, Phenomenex Luna C18(2) 5µ 100A 250x3mm column) using a linear gradient solvent system of water + 0.1% trifluoracetic acid (A) and acetonitrile + 0.1% trifluoracetic acid (B) at 0.5ml/min flow rate. Etonogestrel and ethinyl estradiol fractions were detected using ultraviolet wavelengths at 259nm and 280nm, respectively. Hormone concentrations for each section were calculated from external standard curves (100-50000 ng/mL) of etonogestrel (Sigma-Aldrich) and ethinyl estradiol (Sigma-Aldrich) in methanol. Hormone levels in a NuvaRing® were calculated using its weight and the hormones levels measured in the two weighed sections. Ranges of extrapolated NuvaRing® hormone levels from used NuvaRings® ranged were 8.6 – 11.8 mg etonogestrel and 1.9 – 2.6 mg ethinyl estradiol. Residual hormone levels in a used NuvaRing® were reported as percentages of the hormone levels in unused NuvaRings® processed and run in parallel. The ability to detect a >5% difference in residual hormone levels in a used compared to a new NuvaRing® was determined using a vaginal simulant solution in an *in vitro* sink assay [1].

 **References**

[1] Marques MRC, Loebenberg, R., Almukainzi, M. Simulated biological fluids with possible application in dissolution testing. Dissolution Technologies. 2011;18:15-28.