Supplementary Information Figure 1: Chemical synthesis scheme for [^{125}I]**KX1**.

Supplementary Information Figure 2: Whole western blots and regions of interest generated around the protein of interest.

Supplementary Information Figure 3: Kinetic analysis association and dissociation curves. The following curves represent the rate at which the PARP radiotracer [^{125}I]**KX1** associates and dissociates from the PARP-1 enzyme in a live cell assay. Each curve of the kinetic association graph represents a different concentration at which the rate of association was measured. The rate increases proportionally with concentration.

Supplementary Information Table 1: Summary table for cell lines used in vitro to validate [^{125}I]**KX1** as a marker of PARP-1 expression.

Supplementary Information Table 2: Competitive inhibition (K_i) Values are presented for each PARP inhibitor as measured in the different cell lines.

Supplementary Information Table 3: Experimental association and dissociation values of [^{125}I]**KX1** measured in different cancer cell lines and calculated dissociation constants (K_d).

Supplementary Information Table 4: Dissociation constants (K_d) calculated from saturation experiments and experimental measurements of PARP 1 binding sites defined as B_{max}. These values are used in **figure 6 C** correlating PARP1 expression measured by western or [^{125}I]**KX1.**

Supplementary Information Table 5: Effective concentrations for 50% growth inhibition are shown below. These values were used for correlating PARP inhibitor sensitivity and PARP 1 expression in **figure 4**.